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OPERATIVE EXPERIENCES IN HYDRONEPHROSIS.

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HYDRONEPHROSIS is a chronic aseptic retention of urine in the kidney and renal pelvis accompanied by absorption of some of the renal parenchyma and an interstitial fibrous change in the remainder of the kidney due to obstruction. The obstruction may be in the pelvis of the kidney itself (infection, stone or tumour), at the uretero-pelvic juncture (valve formation, stricture or aberrant renal vessel), in or around the ureter (stone), at the uretero-vesical juncture (achalasia of the uretero-vesical juncture), or at or below the bladder neck.

Young⁽¹⁾ has made the following statement:

An essential fact is that the results of obstruction upon the kidney are fundamentally exactly the same regardless of the point at which the obstruction occurs. There are variations, however, in the cause of the lesion and in the relative importance of the functional and anatomic changes according to the distance at which the obstruction is located from the kidney. Obstructions distal to the bladder are modified in their effects on the kidney by the interposition of the bladder, which is a muscular organ, and which hypertrophies and increases its expulsive effects as the obstruction below increases. As long as the bladder is able to empty itself fairly normally, the valve-like arrangement at the uretero-vesical orifice functions and the kidney is able to discharge its urine freely into the bladder between voidings. The bladder therefore serves to protect the kidneys during this period. Later the bladder fails to empty itself, in spite of violent, frequent and prolonged contractions, and the pressure within it is therefore constantly elevated above normal. When this pressure approaches, during a considerable part of the time, the normal intra-ureteric pressure, the outflow of urine from the ureter is no longer free. The ureter now increases the force of its contractions and takes up the task of protecting the kidney. Eventually it too is overpowered and dilates like the bladder. It is after the bladder becomes decompensated, *viz.*, unable to empty

itself, that the outflow of urine from the kidney is no longer free, and in spite of the efforts of the ureter, the intrapelvic pressure frequently rises above the normal. While it may not be high enough, at any rate constantly, to cause a total suppression of the renal function, the urinary secretion is interfered with and eventually becomes insufficient. Since the period between the beginning of the renal function impairment and the development of hydronephrosis in this class of case may be quite long, the functional aspect of the obstructive uropathy is usually in the foreground when the obstruction is distal to the bladder. When the obstruction is between the bladder and the kidney the anatomic changes are in the foreground for two reasons: first, the pressure effects come on more acutely in the absence of the protective action of the bladder; and second, the functional impairment usually causes no symptoms, since the excretory needs of the body are taken care of by a compensating increase in the activity of the opposite kidney.

Hinman and Gibson showed how the dilatation of the pelvis in hydronephrosis was accompanied by a dilatation of the secretory tubules, the result of which was a compression and partial occlusion of the peritubular venous network. Since all the blood must pass through the peritubular network after leaving the glomeruli, the renal circulation is thus impeded and the resulting ischaemia hastens and furthers the atrophy of the renal parenchyma.

To discuss all these causes would be quite impossible in the space at my disposal, and I intend to discuss unilateral or bilateral hydronephrosis produced by causes proximal to the bladder. I shall therefore confine myself in the rest of this paper to hydronephrosis caused by congenital abnormalities blocking the normal escape of urine from the renal pelvis.

Foley⁽²⁾ has stated that obstruction at the uretero-pelvic juncture is the sole cause of pure hydronephrosis. The hydrostatic effect of such obstruction is felt entirely above this point and produces so-called mechanical dilatation of the pelvis and calyces.

Many authors have emphasized that in the early stages of this process there is no significant parenchymal injury; secretion is merely blocked, and relief of the obstruction

will be followed promptly by practically full recovery of function and of anatomical form (see Case III). If the obstruction is not relieved, permanent anatomical change occurs in the renal parenchyma in the form of hydronephrotic atrophy. If the condition is neglected for sufficiently long, total destruction of the renal parenchyma results, no degree of functional recovery is possible and nephrectomy is required (Case VII). Hydronephrosis is often associated with the different variety of anomalies of the ureter and kidney. In these drainage is impaired by reason of the malformation, and superimposed infection plays an additional role of obstruction. It is interesting to note in passing that in a bifid pelvis hydronephrosis almost invariably occurs in the upper pelvis.

Valve formation at the uretero-pelvic juncture has attracted great interest. The valve is usually due to hypertrophy of the circular smooth fibres of the muscular wall of the ureter (Case VIII).

Aberrant Renal Vessels.

By reason of the fact that aberrant renal vessels lying close to the ureter are not uncommon, there has been considerable opposition to their acceptance as a cause of hydronephrosis; but now, as the result of the work of many authorities who have reported good pyelographic and clinical results following their division, their importance as aetiological agents is more generally acknowledged. If the aberrant renal vessel is associated with a movable kidney, the effect is all the more pronounced (Dietl's crisis).

Obstructions Causing Hydronephrosis.

Obstructions causing hydronephrosis may be divided into those which are extrinsic and those which are intrinsic.

Bobbitt,⁽¹⁾ in discussing extrinsic causes of hydronephrosis, classifies them as follows:

- (a) Aberrant renal vessels and fibrous bands.
- (b) Kidney, abdominal and retroperitoneal tumours.
- (c) Traumatic injuries and defective innervation.
- (d) Fibrosis of the ureter due to irradiation and involvement of the ureter from malignant growth.
- (e) Hydatid or simple cyst of the lower pole of the kidney.

Mathe⁽²⁾ classifies intrinsic causes as follows:

- (i) Congenital:
 - (a) Congenital *per se*.
 - (b) Associated with congenital anomalies of the kidney and ureter (double pelvis and ureter, horseshoe kidney *et cetera*).
- (ii) Acquired:
 - Stricture at the uretero-pelvic juncture, inflammation, stone, tumour.
- (iii) Traumatic:
 - (a) Late sequela of trauma to the cortex, the pelvis or the upper part of the ureter.
 - (b) Following surgical interventions.

Von Lichtenberg⁽³⁾ states that topographically these classes of cases are differentiated according to the location of the obstructing lesion, in the following manner:

- (i) Lesions at the uretero-pelvic juncture.
- (ii) Lesions along the course of the ureter.
- (iii) Lesions in the intramural portion of the ureter and at the opening into the bladder.

Complications of Hydronephrosis.

Complications of hydronephrosis which may occur are (i) haematuria, (ii) infection and (iii) rupture.

Rupture.

Hinman⁽⁴⁾ states that "rupture of the hydronephrotic kidney is rare, whether from trauma or occurring spontaneously". Babitzki collected 20 cases, and Reschke has since collected 23 cases from the literature and added two more of his own. Rupture by means of ureteral catheterization has been reported by Wesson and others.

CASE I.—E.S., a male patient, aged seventy years, was admitted to hospital as an "emergency". His history was that in an argument he had been pushed and that he had

fallen over the foot of his bed. The injury caused sudden acute pain in the lower part of his abdomen; the pain had persisted. He did not vomit and was not nauseated. He had passed no urine since the accident. The patient was a feeble old man, who appeared to be a "poor surgical risk". His abdomen moved only slightly on respiration, the whole abdomen was rigid, but more especially the lower portion. There was generalized lower abdominal tenderness, and dulness was present in the lower part of the abdomen for about three inches above the pubis. Movable areas of dulness were present in both loins. His prostate gland was much enlarged. A tentative diagnosis of intraperitoneal rupture of the bladder was made.

The abdomen was opened and the peritoneal cavity was seen to be half full of urine. The bladder was examined and was found to be moderately full. A large retroperitoneal extravasation was seen in the left iliac fossa, so a catheter was passed into the bladder *per urethram* for drainage; the anterior wound was closed and the left renal area was explored through a lumbar incision. Much urine was found in and around the capsule of the kidney. As the patient's condition was poor a tube was inserted down to the region of the kidney pelvis and the wound was closed rapidly. The blood urea level on the day of operation (March 9, 1935) was 60 milligrammes *per centum*. On March 13, 1935, it was 184 milligrammes *per centum*. Anuria developed and the patient died. A post-mortem examination revealed rupture of a large left hydronephrosis, extravasation of urine, pronounced prostatic enlargement.

Symptomatology.

Hinman⁽⁵⁾ states that "hydronephrosis presents no definite symptoms. It is a common experience that hydronephrosis may progress to a marked degree and be symptomless until a secondary infection supervenes" (Case V). He adds:

Of the more typical idiopathic or ureteropelvic type of hydronephrosis, that commonly attributed to anomalous vessels, Quinby has enumerated the following diagnostic points. Hydronephrosis of this type affects young people; the duration of symptoms is less than ten years; pain is localized and does not radiate down, as a rule, except possibly when it is very severe; there is a heavy dragging ache in the region of the kidney between attacks of colic; the kidney may be palpable from increased size; there is no evidence of renal mobility; and these patients appear healthy unless the kidney is badly infected.

He sums up as follows:

In the histories of any large series of cases pain is a fairly characteristic symptom and is present in the majority of patients. Vomiting may occur; in fact, the symptoms may be predominantly gastro-intestinal. Superficial and deep tenderness and local resistance of the abdominal muscles may be present, but by no means can a tumor always be palpated. Urinary symptoms are inconstant and often lacking. There may be frequency which may be intermittent, pyuria is common, and profuse haematuria may occur.

Cabot,⁽⁶⁾ under the caption "Silent Hydronephrosis", states that "there are cases of hydronephrosis that remain entirely latent for a long time, until attention is drawn to them by symptoms of infection or by phenomena arising from the compression the sac exerts upon neighbouring tissues or organs". He further states that "it has been clinically observed, however, that the anatomical contact of the silent hydronephrotic sac with the stomach or duodenum, through the peritoneum, frequently leads to the formation of gastro-intestinal disorders". Hence it is important to keep in mind the possible significance and symptomatic value of this gastro-entero-renal syndrome. The cases of hydronephrosis that come under his classification into the (a) open and (b) intermittent type are more easy of diagnosis, as the symptoms are unmistakably of urinary origin.

Young⁽⁷⁾ has stated that when the lesion is unilateral and the opposite kidney is sound, hypertrophy of the healthy organ occurs. This may reach as high as 140% of its original volume and weight. He goes on to state that symptoms due to functional renal disturbance, when the obstructive renal lesion is unilateral, ordinarily do not exist; it is the symptoms dependent upon anatomical changes that generally bring the patient to the doctor, and it is on these symptoms alone that the urologist must rely for aid in making his diagnosis.

Young further states that the principal symptoms of hydronephrosis due directly to the local condition are pain and tumour. Haematuria is usually associated with calculus, though rarely it is a symptom of hydronephrosis (Cases III and VII). Pyuria is associated with infection. Pain is the most characteristic symptom, although it may frequently be absent altogether; it is usually situated in the loin. In certain cases the pain may be a dull, constant, aching pain in the lumbar region or referred to the umbilical region or elsewhere in the areas innervated by the lower thoracic and upper lumbar nerves.

Braasch¹⁰ holds that the subjective symptoms accompanying hydronephrosis are as a rule not of definite localizing or diagnostic value. Hence there are three features which are peculiar to this condition and which are worthy of notice: (i) the early adult stage of the patient, (ii) the periodicity of attack and (iii) the absence of urinary symptoms.

The Early Adult Stage.

Of 116 patients with intermittent hydronephrosis who have been operated on at the Mayo Clinic, the average age when symptoms first appeared was twenty-one years, the majority showing their first symptoms soon after attaining their full growth.

Periodicity of Attacks.

In practically all the cases the appearance of the attack, while variable, had a certain degree of regularity. The length of the intervals between attacks usually shortened as the condition progressed, and in the intervals the patients were free from symptoms. A constant dull pain was noted only in the later stages of the disease and then usually in cases of secondary infection.

The Absence of Urinary Symptoms.

Although hydronephrosis may have been present for many years, but few patients complained of urinary symptoms; their absence is of value in the differentiation of the condition from pyonephrosis and from lithiasis. The presence of gross pus was noted in 12 cases (10%). The absence of microscopic pus was noted in 16 cases (14%). The pain, while referred more often to the kidney area, may be referred to the anterior upper quadrant of the abdomen or even as low as the umbilical area. The differential diagnosis of hydronephrosis from disease in the gall-bladder and appendix is frequently impossible from subjective symptoms alone (Case IX). Of 116 patients reported by Braasch, 51 (44%) had had previous operations elsewhere for the relief of the abdominal pain.

Objective Signs.

On physical examination, the only data of value would be the determination and identification of a tumour in the lateral upper portion of the abdomen. In Braasch's series of 116 cases tumour was palpable in the abdomen in 38 cases (32%).

Diagnosis of Hydronephrosis.

The most important single factor in diagnosis in my opinion is a knowledge of the condition and a constant consideration of it in the differential diagnosis of all cases of abdominal pain. Hydronephrosis *per se* is to me the most vital reason why the general surgeon should maintain an interest and further should perfect himself in the manipulative means of undertaking a urological diagnosis. Patients with this trouble frequently consult a general surgeon; many have had a harmless appendix removed and some a gall-bladder, and not a few have had a laparotomy for the removal of an ulcer, which the radiologist was unable to demonstrate, and which also eluded the vigilant eye of the surgeon.

As students we were taught the frequency with which a stone in the lower end of the ureter caused an appendiceal scar and we were admonished as to the importance of an X-ray examination of the urinary tract and a microscopic examination of a catheter specimen of urine.

But in the interval knowledge has advanced with improved methods of investigation, and hydronephrosis of whatever aetiology has become a matter of everyday diagnosis. It is my belief that whereas we formerly asked for a plain skiagram of the urinary tract, we should now ask for a plain skiagram of the urinary tract plus an excretion urogram. These will give us a good idea of the anatomy of the urinary tract and a rough idea of its function. If in the excretion urogram the anatomy of the kidney pelvis and calyces is perfectly normal, there is as a rule no need to proceed further in the investigation of the upper portion of the urinary tract; but if the urogram should reveal a narrowing of the pelvic-ureteral junction or a dilatation of the pelvis on one side compared with that on the other, or if the minor calyces are blunted, or if there is seen a constriction of the ureter suggestive of an aberrant renal vessel, a filling defect in the pelvis or calyces or a poor shadow on one side, a complete urological investigation (including an examination of the bladder, differential renal functional tests, measurement of capacity of the renal pelvis and a retrograde pyelogram) is called for to exclude possible urinary tract abnormality before any surgical procedure is undertaken.

At this point I should like to stress the importance of estimating, as a routine measure, the emptying time of the renal pelvis and ureter. Its routine estimation is helpful in the decision as to whether some lesion is interfering with adequate drainage. Henline and Bray¹⁰ state that "when renal pelvic retention is suspected a radiograph taken 10-15 minutes following retrograde pyelography is the simplest satisfactory method of demonstrating delay in emptying", and Fey considers the emptying time of a kidney to be normal if one cubic centimetre is evacuated each minute—an opinion with which the late Harry Harris of Sydney agreed. In 1931 Moore devised a simple modification of the Buckley diaphragm, which made it possible to obtain three pyelograms in quick succession on one 14 inch by 17 inch X-ray film, and the routine use of this aid is helpful in diagnosis (Case XII). As the size of the normal kidney pelvis as demonstrated by retrograde pyelography varies widely, it is generally accepted that the presence of blunting of the minor calyces is the most important evidence of obstruction to the flow of urine.

With the information derived from our complete urological investigation, we should now be able to make a diagnosis of obstruction if it is present in the upper portion of the urinary tract. From the study of the retrograde pyelogram we should also be able to make an accurate diagnosis of the site of the obstruction.

In my experience as a general surgeon, aberrant renal vessels are the most common congenital cause of hydronephrosis. Quinby¹⁰ has made the following statement on the subject:

They generally begin to cause symptoms in youth or early adult life. The patient complains of attacks of pain at longer or shorter intervals, being entirely well between attacks. Diagnosis of aberrant renal vessels is very clear cut and is made from the pyelogram (retrograde best). Awareness of the condition has led to the diagnosis being made at a relatively early period, and it is rare to find any urinary infection present in the kidney, which is often found to have a function only slightly less than normal.

Treatment.

"Indiscriminate nephrectomy for hydronephrosis is not to be countenanced" expresses well the present outlook on the surgical treatment of hydronephrosis. In the hydronephrosis caused by aberrant renal vessels, or adhesions between the pelvis of the kidney and the ureter, the surgical attack is relatively simple. Whatever form the lumbar incision takes, it must be of such extent that complete visualization of the kidney, the pelvo-ureteral juncture and the ureter is easy. After exposure of the kidney and ureter, which is best controlled by a piece of wet tape inserted under it, a search should be made for any aberrant arteries or veins crossing the line of the ureter, and if these are of small calibre they may be divided and tied; this procedure should be followed by a thorough removal of all adhesions between the dilated

pelvis and the ureter. Frequently this is sufficient to give relief of the symptoms and cause a return of the dilated pelvis to its normal size (Case III); but if clinical examination or pyelographic evidence has shown that the kidney is freely movable, and if it is considered that its movability may lead to further attacks of colic, it is wise to add a nephropexy and so fix the kidney that better drainage from the pelvis is possible and all risk of further kinking of the ureter is avoided.

In all cases of obstruction at the pelvo-ureteral juncture demonstrated by pyelography, after all adhesions from the pelvis and ureter have been freed and small aberrant vessels have been divided, it is a wise precaution to compress the renal pelvis and demonstrate its easy evacuation, much as we are accustomed to compress a gall-bladder in its exploration. If any doubt remains after inspection, palpation and compression of the renal pelvis as to the presence or absence of a stricture or valve at the pelvo-ureteral juncture, the passage of a catheter or probe down the ureter through a small opening in the posterior pelvic wall is advocated.

Moore⁽¹⁾ advocates deliberate opening of the renal pelvis for the purpose of determining the exact location of the upper ureteral orifice. In the case of large anomalous vessels, their division is contraindicated, since the renal vessels are terminal and their destruction results in a local infarct with necrosis of renal parenchyma, which may become secondarily infected and so necessitate nephrectomy. In this type of hydronephrosis some plastic procedure in the renal pelvis and ureter is called for. It is in this type of obstruction that the operation of uretero-pyeloneostomy with preservation of the aberrant vessel first advocated by Quinby finds its greatest usefulness. Resection of the renal pelvis may be added if the renal pelvis is greatly enlarged.

Indications for Plastic Repair.

Sargent⁽²⁾ states that nephrectomy should be reserved for those cases of hydronephrosis in which the kidney is known to be worthless and for those cases in which plastic correction has been employed and has failed. It should also be remembered that hydronephrosis, potentially at least, is a bilateral occurrence. "It has been said that a patient subjected to nephrectomy for hydronephrosis during the age of 20-30 years often returns 10 years later with hydronephrosis on the opposite side" (Case IX).

Walters, Cabot and Priestley⁽³⁾ state that plastic operations on the renal pelvis are indicated in the following circumstances: (a) when hydronephrosis of symptom-producing extent is present upon both sides; (b) when hydronephrosis is present in a solitary kidney; (c) when there is hydronephrosis of one kidney in the presence of a damaged or abnormal kidney on the other side. Other determining factors in favour of conservatism and against nephrectomy are the following: (a) ability to relieve obstruction; (b) presence of potential function capable of sustaining life; (c) non-prohibitive risk attaching to the operation; (d) the diagnosis of the condition in youth or early adult life. In the last case, on account of the longer life expectancy and possible damage to the other kidney by accident or disease, conservatism is all the more necessary.

Moore states that, "excluding these cases in which the operation is of necessity and considering those only in which a plastic operation is of choice, it is somewhat of a deterrent to be confronted by the possibility of a failure in one case in five".

Types of Plastic Repair.

Young⁽⁴⁾ states that various operative procedures have been suggested for the direct treatment of hydronephrosis. They may be classified as follows: (a) those designed to reduce the size of the sac itself, (b) those designed to cure by a plastic procedure the ureteral constriction causing the hydronephrosis.

The different methods that have been suggested for the cure of hydronephrosis may be considered under the following headings.

A. Methods extrinsic to the urinary tract proper:

- (i) Division of aberrant renal vessels.
- (ii) Freeing of adhesions between the pelvis and ureter or around the ureter.
- (iii) Renal sympathectomy, division of the hypogastric nerve.

B. Methods intrinsic to the urinary tract:

- (i) Indirect, without resection of the renal pelvis:
 - (a) Plastic operation on the uretero-pelvic junction (Fenger, Schwyzer).
 - (b) With complete division of the ureter and its reimplantation into the pelvis (Kuster, Quinby, Walters).
 - (c) Lateral uretero-pyeloneostomy (Finney, Foley, von Lichtenberg).
- (ii) Direct, with resection of the renal pelvis:
 - (a) Without division of the ureter (Thompson Walker, Walters, Young).
 - (b) With complete division of the ureter and its reimplantation (Walters, Lubish and Madrid, Hamilton Bailey, von Lichtenberg).

Among those who favoured the indirect attack was Trendelenburg (1886), who is generally considered to be the first to attempt this operation. The first successful operation by this method was performed by Kuster in 1891, but it is to Quinby that we must look as its chief advocate and exponent. In 1922, reporting three successful cases in which he had performed uretero-pyeloneostomy on account of hydronephrosis associated with large aberrant arteries, Quinby made the following remarks:

For this type of case, where the kidney has any degree of function, a full section of the ureter followed by its reimplantation into the most advantageous portion of the pelvis, away from the vessels, has thus seemed to us the most ideal form of plastic operation. Uniform success has followed the free transplantation of the upper end of the ureter.

Again writing in 1937,⁽⁵⁾ discussing the same subject, he wrote as follows:

In these cases the type of plastic operation which has given the best results in my hands is that of section of the ureter followed by its reimplantation into a dependent area of the pelvis quite away from contact with the anomalous vessel. This procedure is based on the postulate that the pelvic and ureteral peristaltic waves are of myogenic origin, not neurogenic, and that by its constant beating (current of action) the aberrant vessel causes sufficient interruption of these waves through the years following birth to bring about the resulting dilation of the pelvis. This may be bad physiology to be sure, but at least it offers a theoretical explanation of a condition in which we know there is no true intrinsic obstruction—no stricture, no valve, no stone or anything of that sort.

Waltman Walters⁽⁶⁾ in 1931 reported three successful cases of division and reimplantation of the ureter "in two of which the cause of obstruction was unusually large, anomalous renal arteries and veins, division of which did not seem to be advisable. In the third of these cases the obstruction was the result of sub-epithelial fibrosis." He states that⁽⁶⁾ "if one should choose to reimplant the ureter into the dependent part of the renal pelvis, accurate anastomosis should be made between the cut end of the ureter and the opening made in the pelvis, for any redundant portion of the ureter extending into the pelvis may serve as an obstructing valve".

Fenger adopted the principle of the transverse suture of a longitudinal incision that has proved so useful in the hands of Heinke-Mickulicz in the surgery of the pylorus to the uretero-pelvic juncture, and later Schwyzer applied the principle of the Y-shaped incision and transverse suture. Fenger, comparing his operation with that employed by Kuster, thought his method to be preferable to the resection and reinsertion technique, for the following reasons:

First it is the easier technique and more economical; second it is preferable when the elongation of the ureter is not sufficient to permit the cut ends of the ureter, after excision of the stricture, to come in contact without stretching; third it is easier to secure union of a ureter which has been incompletely divided in a transverse direction.

The principle of the Finney pyloroplasty has also been applied to the pelvo-ureteral juncture by von Lichtenberg.

The plastic principles involved in sections (i) (a) and (i) (b) of part B of the scheme given earlier form the basis of Foley's⁽¹⁾ operation, which in his hands has been most successful. In all the above-mentioned operations no attempt was made to reduce the size of the kidney pelvis directly by excising portions of the kidney pelvis.

Israel (1896) suggested the operation of pyelolipocystomy with multiple sutures of the enlarged kidney pelvis in order to reduce its size, while Albaran suggested heminephrectomy with partial resection of the enlarged kidney pelvis.

Resection of the Renal Pelvis.—By resection of the renal pelvis, the pelvis can be considerably reduced in size, the blood supply to the kidney being left unharmed. This procedure also preserves the continuity of the renal pelvis and ureter and leaves an aberrant renal vessel intact. Moreover, it places the pelvo-ureteral juncture at the most dependent point after suture of the renal pelvis. Thompson Walker⁽²⁾ resected "a large triangular portion of the posterior wall of the renal pelvis, the apex of the triangle being at the uretero-pelvic juncture and the base at the margin of the kidney; a plastic operation for the relief of any malformation of the uretero-pelvic juncture is then performed and the wound closed by Lembert's suture". Young has reported a case in which large areas of the anterior and posterior walls of the renal pelvis had been excised. Walters⁽³⁾ excises the redundant portion of the renal pelvis cranial to the pelvo-ureteral juncture, leaving about one centimetre anteriorly and posteriorly. When this hole in the pelvis is sewn up it changes the course of the ureter from a lateral insertion to a dependent one. I have noticed, in performing Walters's operation, that if the incisions are made slightly curved instead of straight, when the resultant wound in the kidney pelvis is sewn up a further lowering of the uretero-pelvic juncture results. I adopted this principle from the V excision of carcinoma of the lip; if the incisions in this operation are made slightly convex instead of perfectly straight, one avoids a lowering of the lip margin at the site of excision. Walters also reported successful cases after resection of the renal pelvis and total severance of the ureter from the pelvis with reimplantation of the ureter at the most suitable site. Four successful cases by this technique have also been reported by Hamilton Bailey.⁽⁴⁾

Points in the Technique of Plastic Repair.—The type of conservative operation in any given case is best decided at the time of operation and according to the individual surgeon's previous experience with the different types of operation. Fine plain catgut should be used in all plastic procedures on the kidney. Tube drainage should be provided to allow possible leakage from the suture line to drain. Gauze should never be used—a point on which W. J. Mayo laid great emphasis—as it may adhere to the suture line and disturb it when removed.

Thompson Walker⁽⁵⁾ in his "Genito-Urinary Surgery", published in 1914, advocated the use of catgut, drainage by nephrostomy, and nephropexy, a fact which seems to have been overlooked by many writers on this subject. Walker also states that "an early diagnosis and operative treatment are therefore of extreme importance. In the fully developed hydronephrosis where the layer of kidney is reduced to half an inch, the organ still retains a considerable degree of functional power."

According to many writers, Papen (1928) first advocated the principle of drainage of the renal pelvis following plastic operations on the renal pelvis, and it is now a generally accepted routine procedure. Walters states that it has been utilized as a routine procedure based upon the belief that it relieves tension upon the lines of suture and prevents oedema after operation from obstructing the outflow of urine and thus throwing additional tension upon the suture lines.

Ormond, in 1936, introduced the idea of splinting the ureter with a catheter inserted through the nephrostomy opening, and this also has become a routine step.

Nephropexy is also a frequently added procedure.

Nephropexy.

At this point, let me digress to consider the various techniques suggested for nephropexy. This operation was much more frequently seen on operation lists twenty years ago than it is today. There was a time when, on clinical examination, the finding of a kidney a little more movable or even a little more easily palpable led to a fixing operation, and so a method which in itself is good in suitable cases fell into disuse because of wrong application. In recent years we have seen general surgeons—for example, Waltman Walters—and also some urological surgeons—for example, Cabot and Mathe—advocating its performance in suitable cases.

Thompson Walker, in the 1913 edition of his "Genito-Urinary Surgery", wrote as follows on the subject of movable kidneys:

In certain cases palliative treatment is contraindicated and operative treatment is imperative (i) where there are signs that the mobility is causing disease of the kidney. This includes cases in which the kidney is tender or enlarged, cases of intermittent hydronephrosis, cases in which haematuria or albuminuria is present or there are tube casts in the urine, or slight or severe attacks of torsion of the renal pedicle have occurred. (ii) Where the kidney is exerting harmful traction upon other organs. This includes cases where there are gastric and intestinal crises and attacks of jaundice. (iii) Where the kidney lies below the waist line and is uncontrolled by any mechanical apparatus and the use of a mechanical apparatus causes pain and aggravates the symptoms. (iv) Where the patient is going to reside in tropical or uncivilized countries. (v) Where the patient has to perform manual labour and the expense of maintaining an apparatus in good order cannot be borne.

Howard Kelly, one of the great "four musketeers" of the Johns Hopkins school, wrote a monographic work on diseases of the kidney, ureters and bladder, which was published in 1914. In its dedication sheet the work contains this most generous appreciation of gifted colleagues:

To Doctors William J. and Charles H. Mayo, creators of a surgical era whose personalities are enshrined in the affections of thousands of their colleagues and fellow countrymen, these volumes are affectionately inscribed by the writers and by many of their co-labourers, sometime members of the gynaecological staff of the Johns Hopkins Hospital.

Kelly devotes over fifty pages of his book to the consideration of movable kidney and finishes his discussion with the following sentence:

In all cases where there is beginning dilatation of the renal pelvis we should advise kidney suspension, and also in all cases where there are attacks of renal colic, whether there be a general enteropelvis or not.

Young, in his "Practice of Urology", published in 1926 (Volume II, page 22), states that he usually employed the triangular stitch of Kelly, fastening the kidney to the twelfth rib without decapsulation. A recent summary by Hunner shows that many fewer operations are now performed in the gynaecological department of the Johns Hopkins Hospital than formerly for movable kidney. The ultimate results of nephropexy have proved less favourable in cases followed for a long time, and the other forms of treatment have given better results when faithfully carried out.

Hinman, in "Principles and Practice of Urology", published in 1935, at page 1013, states that nephropexy is one of the most satisfactory of operations when performed on a suitable subject. He holds that the difficult problem is the proper selection of patients for the operation. Most failures of nephropexy are either diagnostic mistakes or are the result of the non-recognition and treatment of some of the more important associated conditions. Many successes result more from the accidental freeing of the ureter at the time than from actual fixation. The consideration of symptoms should conform to the practical needs of differential diagnosis, in order that this highly successful procedure will be neither neglected nor abused. With this in mind, cases of nephropelvis, as emphasized in the beginning, should be divided into two clinical groups as follows: group I—those which produce no symptoms or

disturbance and have no clinical significance; group II—those which cause symptoms or disturbance either directly or indirectly. It is probable that the first group gives rise to the greatest confusion in differentiation and accounts for the majority of the failures of nephropexy. This is because the symptoms of movable kidney are not always referable to the kidney or urinary tract. In many cases the mobility causes pronounced gastric and digestive disturbances, with or without nervous symptoms, and the problem is to determine whether this association is causal or casual. Kelly (1914) showed that the degree of mobility had no relation to the type, number or severity of symptoms. Patients without symptoms may have first, second or third degree mobility, and those with the most typical and pronounced symptoms may show little more than normal mobility. The actual mobility is unimportant compared to its effect on the pedicle, on the ureter and on peritoneal and other attachments.

The decision that a case belongs in group I is easy whenever the mobility is discovered more or less accidentally during a routine physical examination and if the patient has no complaint or disturbance suggesting a possible relationship. Usually the doctor does well to keep his discovery to himself. There is always the possibility of a silent uninjected hydronephrosis in such a case, and excretion pyelography, which is safe and simple, should be performed in the majority of instances to determine whether this is so. The other decision, whether a patient with a movable kidney and symptoms which may be related to it belongs in group I or group II, is more difficult and often requires a prolonged period of study.

The symptoms and disturbances associated with nephroptosis (group II) are legion; they can be subdivided into those referable to the urinary tract and those of doubtful origin.

Symptoms and disturbances referable to the urinary tract are: typically urological pain, obstruction, infection. Pain is common, it may be dull and more or less continuous, or it may occur in the form of the sharp, acute attacks described by Dietl in 1864 so well as to be called "Dietl's crisis" ever since. The ache usually is confined posteriorly to the loin or in front to the area over the kidney. It may be low in the groin or in the hip, but as a rule it does not radiate. Usually the dragging pain is relieved by lying down; it may not be present in the morning, but comes on during the day, and is aggravated by exercise, menstruation, constipation *et cetera*. The Dietl's crisis is less common and is of varying periodicity and severity, even in the same patient, who may be perfectly comfortable between attacks or may complain of a dull ache. The "crises" last from a few minutes to a few hours and may be so severe as to occasion nausea, vomiting, sweating and even shock. Months may go by between attacks. The inciting cause often is thought to be some strain or unusual movement. Occasionally it is noted that the urinary output is increased after an attack.

Obstruction is an objective finding and may or may not be associated with pain. It is manifested by pelvic and calyceal dilatation and by the renal changes characteristic of back pressure. It is demonstrated by the ureteral catheter (pelvic retention) and pyelography or by excretion urography. The findings by the latter method, however, are unreliable as a rule.

Infection is also an objective finding in most cases (pus in the urine), although periodic attacks of fever with or without pain may initiate the investigation. The determination of the relation of renal infection, which may occur without much change from back pressure (stasis) or with definite obstructive changes (hydronephrosis) to nephroptosis, is a matter for a complete urological study. The problem of infection when it exists alone (without pain and without change from back pressure) is intricate. It involves differentiation of a urogenitogenous (obstructive) type from a focal pyelonephritis. The infection may be focal in origin, occurring because of many factors unrelated to mobility, or it may be either ascending or focal, occurring as a direct result of obstruction.

Symptoms and disturbances not referable to the urinary tract itself, in association with nephroptosis, are mainly

gastro-intestinal and nervous. Gastric and nervous symptoms without the localized triad "pain-obstruction-infection" are hard to interpret. In most cases, the gastric symptoms (nausea, vomiting, eructations, indigestion, constipation or diarrhoea, mucous colitis *et cetera*) are of indirect symptomatic nervous origin, and are entirely independent of renal mobility. A neurotic disposition is the natural result of prolonged pain and discomfort and a life of chronic invalidism; but when the gastric and intestinal symptoms show no such antecedent history of localizing symptoms, they are in all probability unrelated to the renal mobility. When gastric symptoms occur with renal "pain-obstruction-infection", they fit into the clinical picture of nephroptosis. The same may be said about nervous and neurasthenic symptoms if they have been preceded for some time by localizing symptoms, or if objective evidence is found of obstruction or infection, which indicates that renal mobility is disturbing function. A neurotic or hysterical person, however, without such history or finding, will not be benefited by nephropexy. The common type of clinical progression, therefore, is, first localized "pain-obstruction-infection", second, a varied train of gastric and intestinal symptoms, and third, nervous and hysterical states. Of course, gastric symptoms may be the only complaint, since localizing urinary symptoms may be absent; but in most of these cases examination will reveal renal changes from back pressure or infection. From 80% to 85% of Thomas's 75 patients had symptoms referable to the urinary tract and only 15% to 20% had gastro-intestinal symptoms. It is doubtful whether mere dragging upon the pedicle will initiate reflex nervous disturbances.

A movable kidney may give rise to symptoms "indistinguishable clinically from true gallbladder disease" (Scholl, 1928). Obstructive jaundice has been observed and cured by nephropexy. Displacement of the gall-bladder or duodenum by the downward peritoneal pull apparently kinks the cystic or common duct (Hutchinson, 1902).

Cabot writes as follows in the 1936 edition of "Modern Urology", Volume II, at page 478: "In general it may be said that any type of conservative operation ever performed on the kidney should be accompanied by a fixation of the organ by nephropexy." This statement seems to express surgical opinion at the present time.

In the performance of a nephropexy it is best to avoid passing sutures through the parenchyma of the kidney, as this must cause some destruction of the renal parenchyma either directly or indirectly through interference with the blood supply. Kelly's method, of which Mathe's is a slight modification, and Cabot's method, avoid this risk.

General considerations that are of importance in nephropexy are the following: (i) "To fix the kidney well it is essential to place sutures of such a kind into the kidney that it is temporarily held firmly against the muscles of the back until fibrous union has taken place, this being unquestionably facilitated by scarification of the fibrous capsule or its partial removal. Many experiments have been made as to the effects of decapsulation. The results are practically uniform, showing that a new capsule is formed which is attached both to the kidney and the surrounding structures and forms a strong adhesion to the abdominal wall" (Kelly). (ii) The fatty capsule must be carefully removed wherever it may come between the muscles and the kidney (Thompson Walker, Kelly). "When the fatty capsule is very abundant we excise part ligaturing the cut vessels with catgut sutures. The part left behind or the whole, in cases where we do not feel the need of removing it, is sewn into the incision, being brought up and attached to quadratus lumborum muscles in order to act as a cushion to creat new adhesions and maintain the kidney in its newly formed position" (Kelly, Cabot). (iii) The surgeon must make careful observations as to whether the ureter is free and in its proper relation to the pelvis of the kidney, and whether there is any twisting of the kidney or its muscular pedicle or any torsion on its parts. It should be sewn so that all these relations are normal (Kelly, Cabot).

ILLUSTRATIONS TO THE ARTICLE BY DR. RICHARD FLYNN.



FIGURE I.



FIGURE II.



FIGURE III.



FIGURE IV.



FIGURE V.



FIGURE VI.



FIGURE VII.



FIGURE VIII.



FIGURE IX.

ILLUSTRATIONS TO THE ARTICLE BY DR. RICHARD FLYNN.



FIGURE X.



FIGURE XI.



FIGURE XIII.



FIGURE XIV.



FIGURE XV.



FIGURE XVI.



FIGURE XVII.



FIGURE XVIII.



FIGURE XIX.

Nephrostomy.

I have always used Walter's method of nephrostomy. A ureteric sound or a probe is passed from an opening in the kidney pelvis through the middle or lower calyx of the kidney and a strong silk suture is drawn through. A de Pezzer catheter together with a number 5 ureteric catheter is then drawn through. If this procedure is followed, the hole in the kidney closes without difficulty when the catheters are withdrawn.

Discussion of the Various Operations Suggested and the Cause of Failure.

When one considers the various types of operation which have been suggested for the cure of hydronephrosis, one's thoughts naturally turn to the physiology of the pelvis, the pelvo-ureteral juncture and the ureter. We know—and it has been demonstrated to me by Braasch on several occasions—that if the kidney pelvis is stroked soon after its removal it will contract. Harris has shown that the sympathetic supply is a dilator to the kidney pelvis, and after its section in cases of renal sympathetic cootons the kidney pelvis and its associated calyces contract and empty better.

Jona⁽²⁰⁾ states that it has not been experimentally demonstrated, so far as he knows, whether any disturbance of the normal neuro-muscular mechanism in the pelvis and ureter can produce the condition of hydronephrosis. One might have hoped that unequivocal experimental evidence of this nature would be forthcoming before the wave of so-called "renal sympathectomy" operations for hydronephrosis and hydroureter had set in. Much conflicting clinical evidence is available; but one finds difficulty in obtaining a clear and satisfactory analysis of the benefits often claimed for this operation. There is plenty of experimental evidence to prove that the secretory apparatus can continue to function more or less normally when all the nerves to the kidney have been cut, although Quinby has shown that stripping of the renal vessels is not sufficient to ensure complete denervation of the kidney, since a few nerve fibres are actually within the vessel wall. Quinby advocates the giving of eserine or strychnine to increase the tone of the kidney pelvis musculature.

Jona and others have shown by pyeloscopy and pyelometry that the kidney pelvis exhibits regular rhythmic contractions. Jona sees a remarkable parallel to what takes place in the heart, in the contraction of the calyx and then of the infundibulum, then the passage of the globe down the ureter and finally down the entire pelvis and ureter as a whole. Can the parallel be taken further? Is there in the musculature of the calyces, infundibulum, pelvis and ureter, anything with a similar function to the bundle of His in the heart? From another field of surgery, gastric surgery, we may draw an analogy.

Alvarez⁽²¹⁾ writes as follows:

The one thing that the stomach will not tolerate well is removal of a V-shaped segment from the lesser curvature, and the reason for this is plain. Anyone who watches a wave travelling down the stomach can see that the flank on the side of the greater curvature must travel faster than the flank on the lesser curvature because it has a longer distance to go. In a case in which the lesser curvature has been still further shortened as a result of a V-shaped excision I saw with the roentgenoscope that the wave flank on the inner side reached the pylorus ahead of the flank on the outer side and ran back up the greater curvature a short distance. There the united wave tried to force material out where there was no opening, and as a result the stomach failed to empty. It seems probable from studies made on the rhythmicity of muscle from different parts of the stomach that there are two pacemaking regions, one in the lesser curvature near the cardia and the other at the upper end of the muscle in the pars pylorica. Neither one seems to be essential, however, because the stomach functions well enough after these regions have been removed surgically. Parzani in 1931 and others have removed the lesser curvature of the stomach without changing peristalsis. As one would expect from this, there is little evidence to show that ulcers or cancers situated along the lesser curvature ever block gastric waves in the way in which a similar lesion would interfere with the heart beat if it were to be set down athwart the bundle of His.

I think that we shall have to leave the question here until such time as the research worker is able to show us the things we seek, and until that is done our plastic operations on the kidney pelvis have no physiological basis.

Sargent⁽²²⁾ states that he has felt "a sense of added security whenever our purpose could be accomplished without completely separating ureter and pelvis".

Reports of Cases.

CASE II.—B.G., a male patient, aged eighteen years, was referred to me on account of pain, which was considered to be due to chronic appendicitis. The patient had suffered from pain in the right iliac fossa and in the right lumbar region; frequently he had had a dull pain in his right loin. Examination revealed no particular tenderness over his appendix, but considerable tenderness in the right costovertebral angle. The right kidney was not palpable. Microscopic examination of urine revealed no pus or blood cells. An excretion urogram on September 20, 1938 (Figure I) revealed dilatation of the right renal pelvis and calyces and narrowing of the pelvo-ureteral juncture. A cystoscopic examination, along with catheterization of both ureters, was made. A differential renal functional test with indigo-carmine revealed good excretion on both sides. A right retrograde pyelogram (Figure II) was made; this confirmed the presence of right-sided hydronephrosis with obstruction at the pelvo-ureteral juncture. The emptying time was delayed.

The right kidney was explored, a small aberrant renal vessel was divided and the pelvis of the kidney and upper end of the ureter were freed of adhesions. As neither the pelvis of the kidney nor the ureter had been opened, it was felt that it was perfectly safe to open the peritoneal cavity, and appendicectomy was performed without difficulty. Convalescence was uneventful. An excretion urogram was taken on December 8, 1938 (Figure III), and the radiographer reported as follows: "There has been considerable diminution in the size of the pelvis and calyces of the right kidney since the previous examination."

The patient has been entirely free of all pain since the operation. However, as all pyelograms reveal a persistent obstruction in the course of the left ureter, I intend to explore his left ureter in the near future.

CASE III.—F.L., a male patient, aged thirty-five years, was under my care in hospital on account of recurrent boils. He was seized with severe left renal colic, which required morphine for relief. There was macroscopic blood in his urine after the attack. A plain skigram of his urinary tract revealed no calculus, but an excretion urogram (Figure IV) revealed a well-marked left hydronephrosis. Cystoscopic examination revealed good excretion from both kidneys, and a retrograde pyelogram confirmed the presence of a large left hydronephrosis. A tentative diagnosis of large left hydronephrosis secondary to an aberrant renal vessel was made. At operation the diagnosis was confirmed and the aberrant renal vessel was divided. Three weeks later an excretion urogram was again made (Figure V), and this revealed a perfectly normal outline of the pelvis and calyces of the left kidney. The patient has had no recurrence of his colic.

CASE IV.—L.J., a male patient, aged forty-four years, came to me complaining of a "bad back"; he said that he had passed stones periodically. He had had severe pain in the groin that had caused him to vomit, and he had passed blood. Microscopic examination of his urine revealed no pus. A plain X-ray film disclosed an area of increased density suggesting calculus in the region of the right renal pelvis. A cystoscopic examination was made; both ureters were catheterized without difficulty and urine was collected from both sides. A macroscopic examination revealed pus in the urine from the right kidney, none in that from the left. A right-sided pyelogram showed that the shadow, previously reported as a stone, was included in the outline of the kidney pelvis and that the ureteric shadow below the uretero-pelvic juncture was obliterated. A provisional diagnosis of kidney stone with an aberrant renal vessel crossing the upper end of the ureter was made.

At operation the kidney was exposed through a Mayo lumbar incision and the lower rib had to be resected. The kidney was incised, the stone was removed and an aberrant artery to the lower pole was divided and ligated with silk. A catheter was passed down through the pelvis and ureter into the bladder without obstruction being met. Convalescence was associated with much intestinal distension, but otherwise was uncomplicated.

The patient returned later on account of symptoms suggestive of a recurrence of stone in the right kidney. He

had had pain in the right side of the chest, but had passed no stone or blood since his operation. Cystoscopic examination revealed slight enlargement of the middle lobe of the prostate with no residual urine. An excretion urogram was made at that time; the report was as follows: "Both kidneys are functioning normally and are excreting the dye well. Radiographic appearances of the right urinary tract appear normal."

CASE V.—F.M.C.A., a female patient, aged twenty-nine years, had had recurrent attacks of "pyelitis" during the six months preceding consultation on August 18, 1938. She complained of severe attacks of pain commencing in the right lumbar region, which worked around the front to the umbilicus and sometimes down into the groin. She always had a dull ache in the right loin. The attacks of pain generally lasted for three days and were accompanied by nausea and vomiting. She had suffered from frequency of micturition, passing urine every hour in the day-time and being forced to do so six or seven times at night. She had noticed severe burning after micturition.

Examination revealed that her blood pressure was 112 millimetres of mercury systolic and 76 diastolic. She was anaemic. Tenderness was present in the right lumbar area and in the right costo-vertebral angle. On August 18 an excretion urogram suggested some abnormality at the right pelvo-ureteral juncture. On August 22 a cystoscopic examination revealed that both kidneys were functioning normally, and differential functional tests disclosed good excretion on both sides. A right-sided pyelogram revealed gross clubbing of the right major calyces, dilatation of the right renal pelvis and apparent kinking and dilatation of the upper portion of the right ureter (Figure VI). Microscopic examination revealed pus cells in the urine from both kidneys, and culture of the urine from both sides yielded a profuse growth of Gram-negative bacilli (*Bacillus coli communis*). Next day the patient vomited more than is usual; fluids were given intramuscularly. On August 28 she had a rigor and looked pale and ill. The pulse rate was rapid, and tenderness was present in the right loin. Skigrams taken for estimation of the emptying time had shown that it was delayed, and it was thought that urgent nephrostomy was indicated, as the patient had become anuric. Nephrostomy was performed, the kidney pelvis and ureter were freed of adhesions, and an aberrant renal vessel was divided. The patient had a stormy convalescence. An excretion urogram made on September 18 showed that the right urinary tract was free of any abnormality.

On October 10 a microscopic examination of a catheter specimen of urine from the bladder was reported on as follows: "Fairly numerous pus cells, a few epithelial cells, and one granular cast. No blood, no crystals, some mobile bacilli present." Culture yielded one colony of Gram-negative bacilli (colon bacilli). A full blood count was made on September 12, 1938. The haemoglobin value was 38%, the red blood cells numbered 2,930,000 per cubic millimetre, the colour index was 0.65. The white cells numbered 9,400 per cubic millimetre; 72% were neutrophile cells, 1% were eosinophile cells, 21% were lymphocytes, 6% were monocytes, and no basophile cells were seen. Of the neutrophile cells, two were band forms. Some of the neutrophile cells contained slight toxic granules. Dr. Eva Shipton reported that "the red corpuscles still show the unusual elliptical cells, many being sausage-shaped. The stippling is pronounced". The patient was sent home with a prescription for mandelic acid.

On February 16, 1939, the patient was again examined. She had had no pain since her operation, and no frequency of or burning on micturition. Microscopic examination of the urine revealed a few pus cells and an occasional epithelial cell; there were no blood, no casts, no crystals and the urine was sterile. A blood count revealed that the red blood corpuscles numbered 3,860,000 per cubic millimetre, the haemoglobin value was 56%, and the colour index was 0.73. The white cells numbered 5,100 per cubic millimetre; 58% were neutrophile cells, 32% were lymphocytes, 7% were monocytes, and 3% were eosinophile cells. The pathologist reported that the red cells showed marked ovalocytosis, and some were deficient in haemoglobin; no nucleated forms or polychromasia were seen. The white cells were mature and no toxic changes were observed.

CASE VI.—F.M.C.D., aged fourteen years, a female patient, was admitted to hospital on January 20, 1939, on account of sharp pain, which began in her right loin and radiated down into her right groin. The pain was intermittent, and each recurrence lasted about fifteen minutes. She had vomited with the pain, but was not nauseated. She had had no frequency of micturition and no scalding. She had been referred to hospital with the tentative diagnosis of intussusception. Her appendix had been removed elsewhere two years previously. However, her history suggested that the pain was of renal origin.

On examination no mass was palpable in her right iliac fossa. A plain X-ray film of her abdomen revealed no shadows suggestive of an intestinal obstruction, nor did an X-ray examination of her alimentary tract after a bismuth meal. An excretion urogram was made on January 26 and the report was as follows: "No calculus detected in the plain ray. There is a constriction of the distal portion of the pelvis of the right kidney, which is constant in the three films. Constriction could be caused by an aberrant renal vessel." (See Figure VII.) A retrograde pyelogram (Figure VIII) was made after cystoscopic investigation. It confirmed the presence of a constriction at the pelvo-ureteral juncture, and a further skigram taken to estimate the emptying time showed that it was delayed. A provisional diagnosis of aberrant renal vessel was made.

At operation on February 5 the patient's right kidney was exposed and the pelvo-ureteral juncture was examined. An aberrant renal vessel was seen crossing the upper portion of the ureter; this was divided and both ends were ligated. The kidney pelvis and upper end of the ureter were freed of all adhesions. A nephropexy was performed after the method of Kelly with the Brodel triangular stitch. An excretion urogram made on February 17 showed that both kidneys were secreting normally and that both urinary tracts appeared to be free of any abnormality (Figure IX).

CASE VII.—E.M., aged thirty-four years, consulted me on May 23, 1938, because she had passed blood in her urine. She said that for the preceding six weeks she had been passing bright blood in her urine. The bleeding had been associated with scalding and frequency of micturition; she had had to pass urine every hour day and night. She also complained of weakness and exhaustion and said that she had lost over a stone in weight. Microscopic examination of a catheter specimen of urine revealed numerous red blood cells, pus cells and organisms. On culture a profuse growth of *Bacillus coli communis* was obtained. A skigram of her urinary tract was taken and the report was as follows:

There are no shadows suggestive of opaque calculus in either urinary tract. There are several shadows suggestive of phleboliths in the pelvis. The flat skigram shows the left renal area to be enlarged. Urograms taken 5, 10 and 15 minutes after intravenous injection of "Per Abrodi" show both kidneys to be excreting the solution and the right urinary tract is free from any radiographic evidence of abnormality. On the left side there is a very marked clubbing of all the calyces and extensive destruction of the renal tissue. The left renal pelvis and ureter are not visualised.

Cystoscopic investigation was carried out. It showed that both ureteric orifices appeared normal, that the right kidney had good function, that the left kidney had little or none, and that both kidneys were infected. A left retrograde pyelogram confirmed the presence of a large hydronephrosis. The ureteric catheter was left in the kidney pelvis for drainage. The blood urea level was estimated at 20 milligrammes per 100 cubic centimetres.

The left kidney was explored on July 27 and a large aberrant renal artery was seen going to the lower pole; it crossed the pelvo-ureteral juncture and appeared to be the cause of the hydronephrosis. As the kidney was functionless, nephrectomy was performed. On March 2, 1939, the patient felt very well and her urine was sterile.

CASE VIII.—V.H.S., a male patient, aged twenty-two years, consulted me on account of severe pain in his right side, which had been present for one month. He had had an acutely inflamed appendix removed two years previously. He had had slight pain under the ribs on his right side for two or three years. Cystoscopic examination revealed that the right kidney was functionless, and a pyelogram suggested an aberrant renal vessel. Right nephrectomy was performed.

The pathologist reported as follows on the kidney:

Macroscopic: A hydronephrotic kidney is submitted. Both pelvis and calyces are much dilated, but are only slightly thick-walled. The ureter is not dilated and its origin from the pelvis is so arranged that a valve-like fold of tissue prevents the escape of urine from the pelvis. The kidney substance shows marked atrophy.

Microscopic: A section of the kidney tissue shows considerable fibrosis of the ischaemic type with thickening of the outer layer of Bowman's capsule and tubular atrophy. Some glomeruli are almost normal except for dilatation of Bowman's space. There is considerable infiltration by small round cells and some hemorrhage.

CASE IX.—C.B., a female patient, aged sixty-one years, consulted me because of recurrent attacks of pain and discomfort in her right lumbar region. The attacks of pain

were accompanied by increased frequency of micturition. She had had her left kidney removed some years previously because of hydronephrosis, and at that time she had been informed that her other kidney was "bad". She also said that her present discomfort was similar to that which she had experienced on her left side prior to her previous operation.

On examination the right kidney was palpable and tender on pressure. The liver was enlarged, but no tenderness was present over the gall-bladder. Microscopic examination of the urine showed that it was free from red blood cells and from pus cells. The urine was sterile. An excretion urogram on November 16, 1938, showed no shadow on the left side (the left kidney had been removed). Dr. B. P. Anderson Stuart reported as follows on the urogram: "There is a large mass of calcified mesenteric lymph glands on the right side, some deformity of the ureter just below the kidney, with well-marked enlargement of the pelvis and calyces. Appearance is consistent with aberrant renal vessel." I decided to explore the right kidney. An aberrant renal vessel and adhesions between the pelvis and upper portion of the ureter were divided on January 20, 1939, and nephropexy was performed after the method of Cabot. As the urinary tract had not been opened, I opened the peritoneal cavity and explored the abdomen. The liver was found to be quite low, but no obvious hepatitis was present; however, a large gall-stone was palpated in the gall-bladder. I felt that it would be safer to remove this at another operation through a more conveniently placed incision. A fortnight later the biliary tract was explored through a paramedian incision. The gall-bladder was found, as expected, to contain a large stone; but a most unexpected finding was the fact that the common duct was greatly dilated (it was about three-quarters of an inch in diameter). It was incised and dilators were passed into the duodenum without difficulty. The dilatation must have been associated with the patient's general visceroptosis. The gall-bladder was removed. The patient's convalescence was uneventful.

An excretion urogram was made on February 13, while the patient was still confined to bed after her operation, and the report was as follows: "There does not appear to be the delay in the pelvis that there was in the previous examination on November 16, 1938, and the pelvis is more normal in shape. There is still, however, evidence of a fairly well-marked hydronephrosis on the right side."

I intend to keep this patient under observation and to repeat the excretion urographic examination in about three months' time. I expect that by then the pelvis and calyces will have greatly decreased in size.

CASE X.—M.B., a female patient,¹ aged forty-two years, consulted me because of right-sided pain and vomiting. Investigation showed that she had a large right-sided hydronephrosis. Walters's type of plastic operation on the renal pelvis was performed on November 19, 1936, and since that time she has had complete relief of her pain. A pyelogram made since the operation shows the reduction in size of the kidney pelvis.

CASE XI.—J.P., a female patient, aged fifty years, consulted me on August 15, 1938, because of pain in her right iliac fossa and in the right loin. She was a highly strung and emotional woman, whose husband had deserted her.

On examination tenderness was present in the right lumbar area and in the right costo-vertebral angle. The right kidney was movable; it did not feel enlarged, but was tender on pressure. Microscopic examination of a catheter specimen of urine revealed pus and blood, but the urine was sterile. An excretion urogram revealed moderate hydronephrosis on the right side with a high origin of the ureter from the kidney pelvis. A cystoscopic examination showed both kidneys to be functioning normally. A retrograde pyelogram confirmed the diagnosis of right hydronephrosis with a high origin of the ureter from pelvis (Figure IX).

On September 6 renal sympathectomy, a Walters's plastic operation on the kidney pelvis, nephrostomy and nephropexy were performed. The patient was discharged from hospital on October 12. An excretion urogram taken on June 19 (Figure X) showed the right kidney to be almost normal in form. The patient has been entirely free of her pain and she has gained about seven pounds in weight.

A. Lawrence Abel, who wrote the chapters on the sympathetic nervous system in Maingot's "Post-Graduate Surgery", states (page 3161) that "plastic operations on the pelvis for hydronephrosis should always be combined with a renal sympathectomy". In my reading I have come across no other writer who advises this to be done. One

thing is certain, and that is that if the advice is followed generally, it will lead to the replacement of a plastic operation by nephrectomy on account of damage to the renal blood vessels, chiefly the veins, which are easily torn.

CASE XII.—H.K., a female patient,¹ aged thirty-eight years, consulted me on account of left-sided pain. Investigation showed that she had a large right-sided hydronephrosis. A Walters's plastic operation on the renal pelvis was performed, and since then she has had none of her previous left-sided pain. An excretion urogram made later shows well the reduction in the size of the renal pelvis.

CASE XIII.—C.B., a male patient, aged thirty-seven years, consulted me on account of pain in the left hypogastric region, which had troubled him for about two years. The pain at times had been so severe that it had "doubled him up"; at other times it was a constant dull ache. He had been told that he had indigestion and had been treated for it. Occasionally the pain had been associated with frequency of micturition and scalding. The pain was not increased by movements and he had noticed no haematuria.

On examination tenderness was present in the left costo-vertebral angle, but the left kidney was not palpable. Microscopic examination of the urine revealed no pus. An excretion urogram revealed a pronounced hydronephrosis on the left; the right kidney outline was within normal limits. Cystoscopic investigation showed the bladder to be normal. A renal functional test with indigo-carmine, after catheterization of both kidneys, showed that the right kidney secreted well, but the left kidney secreted poorly. A left-sided retrograde pyelogram was made; this showed a large hydronephrosis, probably due to aberrant renal vessel. Conservative surgical treatment was recommended.

On October 28, 1938, a Walters's plastic resection of the renal pelvis, nephrostomy and nephropexy were performed. It was a difficult operation, and I felt that a nephrectomy might be needed at any time owing to damage to the renal vessels in the separation of the enlarged renal pelvis from them. On November 12, before the nephrostomy tube was removed, indigo-carmine was injected intravenously and fluid of a strong blue colour drained from the nephrostomy tube. The nephrostomy sinus was healed in a week. An excretion urogram made after operation showed that a large left hydronephrosis was still present. A cystoscopic examination has been made since, and a differential renal function test with indigo-carmine showed poor excretion from the left kidney. A retrograde pyelogram showed a large left hydronephrosis, and the emptying time was much delayed. A microscopic examination of urine from the left kidney revealed no pus, and the urine was sterile.

The patient has gained about two stone in weight and has been entirely freed of his pain; but I feel that his left kidney is now practically functionless, and nephrectomy is indicated. As the indigo-carmine test while the nephrostomy tube was in position gave a good result, I feel that this case was a failure because of some fault in the operative procedure, whether in the type of operation selected or in the difficulty experienced in the performance of the method chosen rather than in a bad selection of case.

CASE XIV.—B.N., aged twenty-three years, consulted me on August 4, 1938, on account of left-sided pain. I have asked him to write me a full account of his story, which is as follows:

In January, 1933, when I was in my eighteenth year, I consulted Dr. X to get a medical certificate of good health. He refused the certificate, as tests showed that there was pus in the urine. Apart from this pus my physical condition was good and I had not suffered any pains or discomfort. This condition was cleared up with treatment in about two months.

About September or October, 1933, I experienced the first discomfort in passing urine. The presence of large quantities of small white crystals in the urine seemed to be the cause of sharp irritation in the urethra towards the end of the penis. The period of irritation lasted from a quarter to one hour as a rule, usually in the afternoon on every third day. This irritation was accompanied by almost compulsory frequency when I passed small quantities of urine at short intervals. These conditions continued until the end of the summer, 1934. I was quite free of all irritation during the winter of 1934, but the trouble returned at the beginning of the summer, '34-'35. The amount of solids passed and

¹ This patient's history has been reported fully in THE MEDICAL JOURNAL OF AUSTRALIA of July 16, 1938, at page 92.

¹ This patient's history has previously been reported more fully in THE MEDICAL JOURNAL OF AUSTRALIA of August 6, 1938, at page 205.

the frequency increased. The irritation in the urethra occurred every day for a week or so, with similar periods of freedom. About February, 1935, I consulted Dr. Y., but got no relief. Relief, however, came with the end of summer. The winter of 1935 was a period of freedom from irritation, but the old conditions returned with the summer months. The conditions over the summer months of 1935-36 were much the same as the previous summer except for the occasional presence of small irregularly shaped solids about one-sixteenth of an inch in size. I put myself in the Dr.'s hands again but failed to get any satisfaction or relief. The winter of '36 brought almost complete immunity. The summer months of '36 saw a return of the conditions, but with a lesser quantity of the small powder-like crystals and more of the small irregular clumps. The condition over the summer 1936-37 was not so severe as previously, but there was no complete relief over the winter months of 1937, explained possibly by the fact that I spent those months in a tropical country. On the advice of a friend I tried taking a teaspoonful of bicarbonate of soda in water every night; this gave me partial relief from the irritation—this was about November, 1937. By keeping up the bicarbonate of soda I kept fairly free of the irritation until about April, 1938, when the condition cleared up. Some time in May, 1938, I passed a small stone about one-eighth to three-sixteenths of an inch in diameter and perfectly round, and rough on the outside. This was accompanied by severe pains in the back for about half an hour. After this I was fairly free from the irritation, although it was always present. Over all this five and a half years I have suffered at odd times from pains in the back. These, however, have never been very severe except at times. During period of relief I could pass urine without any pain (during the winter months mostly) over a period of a few days to a month or so. The pain was most intense during the hottest weather and when most solid matter was present in a congealed state.

The pain, or rather intense irritation, was in the urethra just where it ceases to be muscular. Periods of pain would last from 10 to 45 minutes; the pain would come every few minutes and it seemed to be a natural action to try to force more urine from the bladder as a relief. At odd times I have suffered from pain in the back, but only while engaged in heavy work; the attacks would last only for a day or so. Solids were passed in the urine in three forms: (i) Large quantities of small crystals in a congealed state. (ii) Large quantities of small crystals well mixed through urine. (iii) Occasionally large particles of solids of irregular shape and quite hard.

When passing urine first thing in the morning usually some solid matter would come away first, but causing very little pain or irritation, for it seemed to be well covered with mucus. The most painful time was when a large congealed mass would come away after passing urine. This mass would at times lodge in the urethra and would take some half-hour or so to be got rid of. This would occur usually during the afternoon, and each time urine was passed. After this there would be some irritation, but not so intense. Next morning there would be very little irritation; this would occur every three days. When solids were mixed through the urine there would be irritation, but not so intense.

Physical examination disclosed no gross abnormality. Microscopic examination of a passed specimen of urine on August 10, 1938, revealed fairly numerous pus cells, an occasional red blood cell and fairly numerous triple phosphate crystals, but no casts and no epithelial cells. On August 9 Dr. A. F. Oxenham reported as follows on a plain skogram and an excretion urogram: "No evidence of opaque calculus. Urograms show normal radiographic appearances of the right urinary tract. On the left side the appearance of the solution is delayed and there is marked clubbing of all the calyces and some dilatation of the renal pelvis and visualised portion of the upper end of the ureter."

On August 12 I undertook a cystoscopic investigation. The bladder and ureteric openings appeared quite normal, except that the left was nipple-like—the ureteric opening was on a little hillock. Excretion was good on the right side and very poor on the left. A left-sided pyelogram was made; about 30 cubic centimetres of opaque solution were injected without pain and a skogram was taken. This showed huge dilatation of the lower end of the ureter, and further skograms showed that emptying time was greatly delayed. On account of the resemblance to the radiographic picture of achalasia of the oesophagus, I made a tentative diagnosis of achalasia of the uretero-vesical juncture. To confirm this a further cystoscopic examination was undertaken.

Two catheters were passed through the left ureteric opening, one high up into the region of the kidney pelvis and one about an inch up the ureter. By aspiration through both catheters an attempt was made to estimate the amount of residual urine in the left ureter and pelvis. I aspirated 140 cubic centimetres. Armed with this knowledge, I injected 140 cubic centimetres of opaque solution through the ureteric catheters and a skogram was taken (Figure XI). Spinal anaesthesia was then employed and further skograms were taken.

Spinal anaesthesia has proved useful in the choice of cases of Hirschsprung's disease and chronic constipation in which surgery of the sympathetic nervous system (division of the lumbar rami) will be of use, so it was argued that it should help in the present case. The tentative diagnosis was confirmed by its use. The next question to arise was the ideal site for section of the sympathetic. Remembering Learmonth's work at the Mayo Clinic on the nerve supply to the lower portion of the ureter, I discussed the case with Professor H. R. Dew, and we decided to send a cablegram to Learmonth, who is now professor of surgery at the University of Aberdeen, asking him the best site for sympathetic surgery. He graciously replied next day to our cablegram of consultation, as follows: "Female presacral, male ipsilateral hypogastric nerve immediately distal bifurcation presacral."

On July 15, 1938, I opened the patient's abdomen, and the appearance shown in Figure XII was noted. The left hypogastric nerve was divided without difficulty and the patient's convalescence was uninterrupted. I have kept him under observation since, and it has been extraordinarily interesting to watch the amount of pus in his urine diminish. He has had repeated courses of mandelic acid therapy.

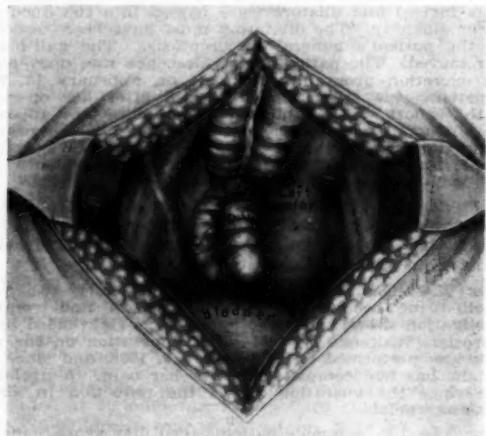


FIGURE XII.

On November 16 I made a cystoscopic investigation and was able to aspirate only 20 cubic centimetres of urine from the left ureter through two catheters; I injected 60 cubic centimetres of opaque solution into the left ureter (Figure XIII), and a radiograph taken sixty minutes later showed that there was very little delay in emptying time compared with that which had existed prior to operation (Figure XIV). A catheter specimen of urine was sterile, and though this last summer has been hot, the patient has had no return of symptoms. An excretion urogram was made on December 19, 1938; it shows quite a good shadow of the lower end of the ureter.

Comparing the pre-operative and post-operative excretion urograms, I argue that when the pre-operative urogram was made so much urine was retained in the ureter that the dye became too diluted to cast a shadow; in the post-operative urogram the obstruction has been relieved, so there is less retention in the ureter. The dye secreted by the kidney is now no longer diluted and so is of sufficient concentration to be opaque to the X rays.

I should like to acknowledge my indebtedness to Professor Learmonth and to thank him and Professor Dew for their cooperation in the treatment of this patient.

CASE XV.—K.M., a female patient, aged twenty years, was admitted to the Royal Prince Alfred Hospital on August 9, 1938, on account of some pain in her right iliac fossa

following a cystoscopic investigation. The pain was similar in character to, but more severe than, the pain which had caused her to consult me in the out-patient department. She had had her appendix removed four years previously. She stated that the pain was of a gripping character; it began in the right lumbar area and radiated towards her pubis. The attacks of pain usually lasted for four or five days and had recurred every few weeks during the previous four years. At first she had had frequency of micturition; but during the last eight months she had had dysuria. Sometimes she passed no urine for twenty-four hours; at these times the pain was severe, but it was relieved when the bladder was emptied. At times the pain was accompanied by vomiting. She had never noticed blood in her urine.

On examination tenderness was present in the lateral part of her right iliac fossa and in her right costo-vertebral angle. An excretion urogram made on July 22 (before her admission to hospital) revealed slight dilatation of her right renal pelvis and a persistent block at the pelvo-urethral junction (Figure XV). Microscopic examination of a catheter specimen of urine revealed no pus cells and no red blood cells. The urine was sterile. A cystoscopic examination on August 9 showed that both kidneys were functioning normally. A retrograde pyelogram showed the renal pelvis to be slightly dilated and the minor calyces blunted. The medial portion of the ureter also appeared to be dilated; but this may have been due to slight over-distension. No definite narrowing or obliteration of the pelvo-ureteral junction, such as is usually found associated with an aberrant renal vessel, was observed. The emptying time was delayed.

Under observation in hospital the patient continued to complain bitterly of her pain, which required morphine for relief. On August 10 the patient was ordered eserine (one one-hundredth of a grain), to be given when she had her attacks of pain; on all occasions she obtained immediate relief after its administration.

Accordingly, after discussing the patient and her symptoms with Professor Dew, I explored her right kidney on August 24. Exploration revealed a mild degree of extrarenal dilatation of the renal pelvis, and a small aberrant renal vein was seen crossing behind the ureter about one inch below the uretero-pelvic juncture. The vessel was divided and ligated. As it did not appear that this vessel could have produced the obstruction seen in the excretion urogram, a hypodermic injection of one one-hundredth of a grain of eserine was given and the renal pelvis contracted to about half volume. As the patient had obtained immediate relief from her severe pain after injections of eserine, and as the aberrant renal vessel did not appear to be a sufficient cause for the pain, and also because the retrograde pyelogram had not revealed the presence of the vessel, I came to the conclusion that her pain was due to renal sympathetictonus. The outstanding clinical feature of this syndrome is the occurrence after temporary relief by eserine of the following three features: (i) unilateral renal stasis, (ii) renal pain, and (iii) costo-vertebral tenderness; the absence of any demonstrable cause of organic obstruction is also necessary. As her pain fulfilled all these demands, a renal sympathectomy was performed. Convalescence was uninterrupted except for severe pain, which appeared to be still of renal origin.

A skigram of the lumbar portion of the spine and of the pelvis was made on September 16; the report was as follows: "No osseous changes detected in the lower dorsal or lumbar vertebrae." Another excretion urogram was made on September 16. The radiographer's report was as follows: "Right hydrourerter present and there is dilatation of the calyces of the right renal pelvis. None of the dye passes down further than the first piece of the sacrum." A retrograde pyelogram was made at this stage; it revealed that the renal pelvis and calyces were no smaller than on the previous occasion. On account of the persistent pain and the evident dilatation of the ureter, on September 22 I divided the right hypogastric nerve. An excretion urogram made on October 10 showed that her right kidney pelvis and calyces were anatomically normal. Her pain has been relieved.

On reviewing this patient and her symptoms, one wonders whether she could have been suffering from sympathetictonus involving the lower end of the ureter; the view is supported by the moderate dilatation evident in the pyelograms. One is left to conjecture whether, if the hypogastric nerve had been divided as the first stage of her treatment, it would have given her relief. She was a red-haired, hysterical girl; but nevertheless her pain appeared to be real and severe.

CASE XVI.—F.H., a male patient, aged forty-eight years, sought medical attention on January 8, 1937, because of a

dull aching pain in his right hypochondrium; the pain had bothered him for many years, but during the last two years it had been so severe that it had interfered with his work. He had been thoroughly investigated before I saw him. X-ray investigation of his stomach, duodenum, gall-bladder, colon and spine failed to reveal any cause for the pain. An excretion urogram made on June 16 revealed some dilatation of the pelvis and calyces of his right kidney. A differential renal functional test showed that both kidneys were secreting the indigo-carmine normally. A retrograde pyelogram showed the renal pelvis and calyces to be dilated. The patient was admitted to hospital for observation. Hypodermic injections of eserine (one one-hundredth of a grain) gave him temporary relief. A provisional diagnosis of renal sympathetictonus was made. At operation on July 1 the sympathetic fibres accompanying the right renal pedicle were divided. The patient has had no recurrence of the pain since the operation.

At my request he reported again on February 22, 1939. He then stated that he had enjoyed complete relief of his pain and that he had commenced work in a fast ax team on September 19, 1937, and had since never been "out of action" for a single day. He was one of the most grateful patients that it has been my good fortune to help.

An excretion urogram (Figure XVII) made on March 9, 1939, showed both kidneys to be excreting normally; both urinary tracts appeared to be free from gross abnormality.

CASE XVII.—W.B.T., a male patient, aged twenty-two years, consulted me on January 4, 1935, on account of frequent attacks of pain in the left lumbar region radiating to the left testicle during the preceding five years. At times the pain was severe enough to make the patient "double up", but it had never caused him to sweat or vomit. About one year previously he had been operated on elsewhere and had had a stone removed from his kidney. For a month after that operation he had been free from pain, but since then the pain had returned and had been more severe than before the operation. He had noticed no frequency of micturition, no scalding and no polyuria. The patient had had haematuria before the operation for removal of the stone, but had noticed none since. Appendectomy had been performed six years previously. There was nothing else of importance in his previous history, and his general health was excellent.

Examination of his urine (a passed specimen) revealed that the specific gravity was 1.010, that the urine was acid, and that it contained no albumin, no pus, no red blood cells and no casts. On January 8 the patient was given an intravenous injection of "Pen Abrodil" and skigrams were taken. The radiographer's report was as follows: "There is same pylectasia on the left side and some constriction of the ureter just below the renal pelvis. Kidney appears to be functioning normally." On January 10 a cystoscopic examination and differential renal function test with indigo-carmine showed that both kidneys secreted normally. A left-sided pyelogram showed well the constriction of the ureter; this I considered to be due to an aberrant renal artery. Microscopic examination of ureteral catheter specimens of urine revealed no pus or red blood cells, and both specimens were sterile.

On January 17, through a Mayo type of left lumbar incision the left kidney was exposed and an aberrant renal artery to the lower pole was isolated and ligated. Convalescence was uninterrupted and the patient has had no further attacks of pain.

CASE XVIII.—D.C., a male patient, aged thirteen years, consulted me on March 1, 1935, because of spasmodic attacks of left-sided abdominal pain associated with frequency of micturition. A urological investigation was made and a diagnosis of hydronephrosis due to an aberrant renal vessel was made. Unfortunately both the intravenous and retrograde pyelograms have been lost. The radiologist's report on the excretion uograms was as follows: "Urograms show normal radiographic appearances of the right urinary tract. On the left side there is definite clubbing of the major calyces, particularly the middle and lower. There is also quite a degree of dilatation of the renal pelvis. Ureter is not visualised in any of the uograms and if possible further examination by the retrograde method of pyelography might be helpful, as the present appearances suggest the possibility of an aberrant renal vessel rather than an infective condition."

On March 14 the left kidney was explored and a moderate degree of hydronephrosis was seen to be present. A small artery crossing the uretero-pelvic juncture was held to be sufficient to cause this. It was divided and ligated. An excretion urogram was made on March 26, and the radiologist's report on it reads as follows: "Urogram shows definite clubbing of all the left major calyces and dilatation of the left renal pelvis. This clubbing and dilatation seem to have increased somewhat since the last examination."

The patient was kept under observation for about eight months and had no recurrence of his pain. I asked him to return for investigation on February 15, 1939, when excretion urography revealed no evidence of any opaque calculus. A sharp demarcation of the left uretero-pelvic juncture and also some dilatation of the renal pelvis itself were still present. The right urinary tract appeared normal (Figure XVIII). A careful inquiry was made into the boy's history since the operation, and he was quite positive that he has had no recurrence of his old severe pains; but he admitted that at times he had a dull ache in the left upper quadrant of the abdomen, which was worse when he was lying down.

Cystoscope investigation was carried out on March 6, 1939, and a differential renal functional test showed that the left kidney secreted excellently. A retrograde pyelogram revealed moderate dilatation of the renal pelvis with sharp demarcation of the left uretero-pelvic juncture. A further skiagram taken to estimate the emptying time showed that it was greatly delayed, as none of the contrast medium had emptied out after fifteen minutes.

At exploration on March 10 the left kidney was found to be enlarged and the pelvis of the kidney was dilated to about the size of a hen's egg. There seemed to be no extra-renal cause for the obstruction. Attempts to empty the kidney pelvis by compression were without success. An opening in the kidney pelvis was then made, and urine spurted out under greatly increased pressure. I next tried to pass a small ureteric catheter and later a probe down the ureter through the opening in the kidney pelvis, but both were held up by a stricture of the ureter about one centimetre distal to the pelvo-ureteral juncture. The stricture was resected and a Quinby type of operation was performed. A ureteric catheter was passed down through the anastomosis into the ureter and was brought out along with a de Pezzer catheter through a nephrostomy opening. The opening in the kidney pelvis was closed and nephropexy was performed. The perirenal space was drained. On May 18 excretion urography revealed a normally functioning kidney (Figure XIX).

Discussion of the Causes of Failure.

In a discussion of the cause of failure in the plastic repair of unilateral hydronephrosis, Hinman's theory of renal counterbalance must be considered. He states that even if the obstruction is removed the operations are doomed to failure as far as functional return is concerned, for the opposite kidney, having undergone anatomical hypertrophy, prevents the repaired kidney from increasing its functional capacity.

Cabot⁽¹⁾ has made the following statements:

The work of Job Jaelson, Beck and Miritz has cast some doubt upon the accuracy of the observation that atrophy of a temporarily obstructed kidney is inevitable if hypertrophy has developed on the other side. It seems more probable that the function of the obstructed kidney will return up to the limit of actual tissue destruction. . . . It is remarkable to note the functional power of regeneration possessed by a kidney suffering with hydronephrosis. Sometimes an enormous sac which still has a certain amount of eliminatory function responds admirably to measures designed for the relief of the mechanical obstruction, showing the importance of a knowledge of the functional capacity of a given kidney before proceeding to any radical operative measures.

Foley⁽²⁾ writes as follows:

The amount of actual function saved by a conservative procedure for relief of uretero-pelvic juncture obstruction may be insignificant from the standpoint of total renal function required, this being contributed almost entirely by the opposite normal kidney. From the standpoint of potential function, however, this salvaged parenchyma is of great importance, for it is capable of remarkable compensatory hypertrophy and hyperplasia with proportionate functional work. A kidney thus conserved may be capable of sustaining life in case of later total impairment or loss of the opposite kidney.

Sargent⁽³⁾ expresses himself thus: "A kidney actually relieved of its obstruction will present the unimpeachable proof of function regained and that regardless of the adequacy of its mate, Hinman and his theory of counterbalance to the contrary notwithstanding."

Walters⁽⁴⁾ has expressed the following views:

The rapidity with which a distended renal pelvis will return to within normal limits of its size, capacity and function, after complete relief of ureteral obstruction, has been strongly evident in the cases of hydronephrosis which

form the basis of this paper. . . . On a previous occasion, in commenting on conservative operations on the kidney, I described other cases of this and other types in which return of renal function after removal of obstructive causes seemed rather remarkable, and this return in function was in association with, or should I say in spite of, a normally functioning opposite kidney. I have felt that this should be emphasised because it would seem that some misunderstanding has arisen regarding renal counterbalance as seen in experimentally produced complete urinary obstruction, contrasted with clinical experience in incomplete obstructions of the urinary tract. Hence, if one is to attempt to preserve an injured kidney when the opposite one is normal, one must have sufficient evidence (which I believe exists) that such a kidney will return to reasonable function rather than decrease in function or undergo atrophy. It has been my experience that it is worth while to preserve any kidney in which sufficient renal parenchyma remains, provided one can adequately relieve the obstruction and eliminate or decrease infection.

In cases in which operation is performed for relief of hydronephrosis by conservative procedures, the kidney being preserved, the criteria by which satisfactory results should be judged are the following: (a) symptoms of obstruction of the urinary tract, such as pain and fever, should disappear; (b) the size of the renal pelvis and calices should return to within normal limits; (c) there should be no retention of urine in the kidney; (d) improvement in renal function should occur, as determined by differential functional and urographic studies made subsequently at intervals.

Mathe⁽⁵⁾ stated that the causes of failure in plastic repair of hydronephrosis were the following: (i) improper selection of cases; (ii) improper selection of the particular type of repair in the individual case; (iii) insufficient correction of the obstructive lesion in the upper part of the ureter and at the uretero-pelvic junctures; (iv) lack of appreciation of certain technical points necessary for permanent relief of renal retention. The points to which Mathe refers are the maintenance of urinary drainage by temporary nephrostomy or ureteral catheter drainage during recovery from the operation, and the assurance of permanent unobstructed drainage by the incorporation of surgical suspension. He believes also that lateral insertion of the ureter is best relieved by lateral anastomosis or uretero-pyeloneostomy.

Cabot has expressed the following views:

It is nevertheless important to realise that many of these plastic operations on the renal pelvis have resulted in failure through neglect to provide drainage by deviation of the urine, through faulty technique in the plastic repair and through failure to secure fixation of the kidney, so that eventually the organ has undergone complete destruction necessitating its total removal by secondary nephrectomy.

A point in the management of these cases that I have not seen mentioned, possibly through insufficient search, is the routine use of an indigo-carmine test before the nephrostomy tube is removed. If this is regularly done, it will allow us to differentiate between improper selection of cases and errors on the technical side of the operation, whether these errors are due to improper selection of the particular type of repair in the individual case or to insufficient correction of the obstructing lesion in the upper portion of the ureter and at the uretero-pelvic juncture. It may also help to secure evidence for the correctness or otherwise of Hinman's theory of renal counterbalance.

With regard to infection as a cause of failure of plastic repair, Quinby⁽⁶⁾ makes the following statement:

In my experience the one outstanding hindrance to successful operation has been infection and my inability to create a condition or to administer any form of treatment after operation which will prevent progress of the infection and eventual destruction of the kidney by pyelonephritis. So important is the role played by infection in defeating attempts at preservation of the kidney by plastic surgery that I have come almost to the opinion that no plastic operation at the uretero-pelvic juncture or the ureter itself can be of avail if the infection cannot be allayed either by a strenuous course of antiseptics administered into the renal pelvis by ureteral catheter or even by a nephrostomy, before the plastic procedure is undertaken.

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Walters,⁽²⁾ in discussing the indications for nephrectomy after plastic repair of a hydronephrosis, stated that the indications for nephrectomy were, almost always, the continued occurrence of pain often accompanied by attacks of fever.

Reported Results of Plastic Repair of Hydronephrosis.

There is a wide divergence of opinion regarding the results of plastic repair of a hydronephrosis. Some are more or less enthusiastic concerning their results, while the results of others are more or less disheartening.

Walters, Cabot and Priestley⁽³⁾ report 71 cases, with a primary mortality rate of 2·81%. In these series the types of operation performed were as follows: (a) resection of the renal pelvis (21 cases), (b) resection with reimplantation of the ureter (nine cases), (c) reimplantation of the ureter (three cases), (d) division of one or more abnormal vessels to the lower pole (two cases), (e) ureterolysis (two cases), (f) uretero-pyeloneostomy (four cases), (g) miscellaneous (five cases) and (h) nephropexy combined with various of the above-mentioned procedures (19 cases). In this series they state that a secondary nephrectomy was required in 15 cases, or 21·2%. It does not appear that these unfavourable results were associated with any particular type of operative procedure. Thus in nine cases a resection was performed, while in each of the remaining six cases a different type of operation had been employed.

It will be noted that of the 15 patients who had a secondary nephrectomy, 12 were treated by nephrectomy within the first year, one two and a half years later and two seven years later. The indications for nephrectomy were almost always continued pain often accompanied by attacks of fever. In this group of 71 cases there were two in which fulminating infection followed operation.

Foley⁽⁴⁾ has reported the results in 19 cases of uretero-pelvic stricture in which his operation of uretero-pelvic anastomosis was performed. There were two operation deaths, and two other patients died of causes not connected with the urinary tract. In the other 15 cases the result, from a symptomatic point of view, was good or excellent in 15 cases. The functional and anatomical result was excellent in five cases, good in seven cases, and fair in four cases.

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⁽²³⁾ C. P. Mathe and E. de la Pina: *Journal of Urology*, Volume XXIX, 1933, page 1.

⁽²⁴⁾ A. von Lichtenberg: "Plastic Surgery of the Renal Pelvis and Ureter", *The Journal of the American Medical Association*, Volume XCIII, November 30, 1929, page 1706.

POST-OPERATIVE TREATMENT IN RADICAL MASTOIDECKTOMY.

By R. E. BUCKINGHAM,
Orange, New South Wales.

OWING to the extra work involved in constantly packing mastoid cavities, I now avoid this by the insertion of a tube in the external auditory meatus. This method of treatment is by no means new; but in the past a few essential details were neglected, with the result that the method has not found favour amongst aural surgeons. The success of a radical operation is proportionate to the drainage, and it is essential that the mastoid cavity in the region of the bridge and the middle ear remain open.

My last patient, who was a difficult young woman, was in hospital for only two weeks, and was able to carry out all the treatment by herself at home, as she lived ten miles away in the country. She had a "dry" ear after three months. The following is a description of the method I adopt.



FIGURE I.
Shows tube nicely in position.

Great care is taken in cutting the flap. A T-shaped flap is cut, and as much cartilage as possible is removed from the upper flap, so that it sits nicely against the bony wall of the mastoid cavity. The same is done with the lower flap, and attention is paid to the fatty tissues which one finds below this lower flap. Each of these flaps is stitched to the upper and lower margins of the wound, as the case may be; this ensures that the flaps remain open, so that a permanent opening into the mastoid cavity is obtained. A tube about the thickness of the index finger, if possible a little larger, is selected and is cut off at one end at an

angle of 45°; this resembles a spout of a teapot. It is preferable for the tube to have a slight curve, as is usually the case with tubes that have been rolled while in storage. The tube is then placed so that the pointed end fills the area in the region of the bridge. If the tube can be placed with the convexity upwards, it will sit in position better. It is essential to see that the tube does not fit too tightly; if it does, one should ease it where the constriction is (mostly at the entrance) by putting little nicks in the cartilage. It is essential to see that there is no undue pressure. The ear is then filled with a 10% solution of ichthyol in glycerine, plenty being poured round the tube; the tube is left in for a month if possible. To guard against perichondritis of the auricle plenty of the solution is poured round it, and the tube is squeezed so that the solution goes between the tube and the auricle. This procedure should be carried out at every dressing, and it is advisable to dress the wound twice a day. If there is any sign of perichondritis, the tube should be removed and a smaller one put in; but better results are obtained if the tube can be left *in situ* for at least a month. The curved incision at the back of the ear is, of course, stitched. If this treatment is carried out, painful dressings are obviated, it is not necessary for the surgeon personally to supervise dressings, and he can be sure that with reasonable luck the period of convalescence will be cut in half.

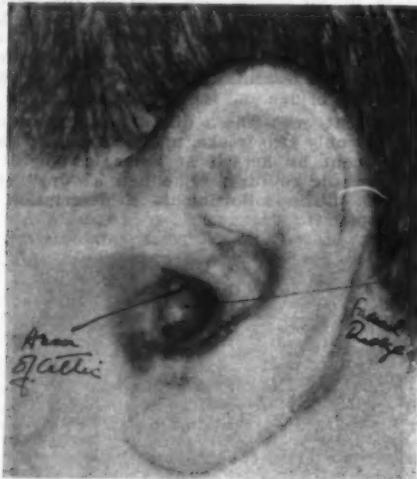


FIGURE II.

Shows facial ridge and region of attic. This photograph was taken two months after the operation.

I have already treated twelve patients by the above method and I am more than satisfied with the results and with the saving, for the patient, of painful dressings and time in hospital, and, for myself, of tedious treatment.

Reports of Cases.

CUTANEOUS HORN OF THE UPPER LIP.

By ALDOUS C. ARNOLD,
Newcastle, New South Wales.

L.C.G., a retired miner, aged sixty-three years, reported to my out-patient department in October, 1941, with a growth on the upper lip; it had been present over twelve months and had been growing rapidly larger during the last nine months.

On examination it was a large cutaneous horn, about two and a half inches long, growing from the left side of the upper lip; it had split in the centre, and the two halves diverged in a spiral manner.



FIGURE I.



FIGURE II.

On October 24 he was admitted to hospital, and under local anaesthesia the growth was easily removed. Biopsy of the base revealed no malignant changes, and the area from which the horn was removed healed uneventfully.

The accompanying photographs (Figures I and II) give an idea of the character and size of the growth.

The Medical Journal of Australia

SATURDAY, JUNE 13, 1942.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

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FESTINA LENTE.

PEOPLE who want to enlarge upon the advance of medical science as one of the wonders of the age generally refer to the progress of surgery and rightly pay homage to the memory of Joseph Lister and of Louis Pasteur who made this progress possible. And indeed it is well that we should pause now and then as we tread the road, the aseptic road, of higher surgical emprise, to look back on the past. It is not a little thing that we can without fear open the abdominal cavity of a suffering human being and know that in the doing of such a deed we do not place a human life in immediate jeopardy. In a recent reference to the late William Chisholm in this journal we had occasion to refer to an address that he gave some years ago to medical students. In this address he mentioned "a most lovable and capable surgeon who once said: 'I'm afraid I have killed this poor fellow' because in performing the operation of lumbar colotomy he had inadvertently opened the peritoneal cavity, a thing seldom deliberately done at that time". But if we are to look back along the way that we have come, we do it not that we may be puffed out with pride at our ability, or preen ourselves because we can make names for ourselves among those outside our calling who do not understand. That the doctor of today has any reason for pride because he may with impunity seek a malign lesion in the peritoneal cavity of a brother man is nothing less than absurd. He has had training in asepsis and has without any difficulty acquired a certain technique which is to him an "open sesame". He has reason to be proud not of himself but of those whose originality of mind and clearness of vision made surgical adventure possible to him. We look back at the road we have travelled that we may see the present in the light of the past, and that we may see ourselves as disciples of the past and in all humility try to become the apostles of a still brighter future.

In the past doctors knew something about diathesis, that "particular condition or habit of body, especially one predisposing to certain diseases"; and consciously or unconsciously they allowed thoughts of diathesis to enter into most of their calculations and inquiries. They had no elaborate tests to guide them, no microscopic or chemical examinations of secretions or excretions, no X-ray pictures taken perhaps after the ingestion or injection of a dye that serves the purpose of a contrast medium. They knew little about bacteria and the vagaries of the blood cells were a closed book to them. When this newer knowledge came gradually, as it did, the clinician, if he was wise, added the new to the old and did not give himself solely to what he had just acquired. And in his deliberations he was not hurried as some of us are today. At the same time there was, as Robert Scot Skirving has reminded us, a danger that "worthy old doctors" might "let acute maladies drift to immeasurable tragedy just because they were obsessed by the diathetic verities of the patient's aspect". Today in the plethora of scientific aids to diagnosis diathesis is easily forgotten; it may also receive too much attention and Scot Skirving tells us that "when we amuse ourselves with 'spot diagnosis', we must carefully distinguish, when we come to treat a patient, the diathesis from the actual present substantive malady". If in the days when diathesis was given prominence doctors were more leisurely in diagnosis and more deliberate in treatment than they are today both diagnosis and therapy could not fail to benefit. Without intention doctors in such circumstances gave free play to that most excellent of all doctors, the *vis medicatrix naturae*. We have need therefore to ask ourselves whether in our hurry we do not often deprive the patient of Nature's healing touch. How often is the practitioner, particularly one who has not reached years of surgical discretion, tempted, for example, to display his technique, to call on his "Open Sesame", to rid his patient at one cut of the knife of a lesion which, if it does really exist, will vanish if left to Nature? The uterus and its adnexa are of all organs most liable to be exposed to such indiscretion. A large treatise might be written on the gynaecological conditions which will resolve with little more treatment than rest in bed and possibly attention such as a trained nurse can give. The young married woman stands in danger of this hasty and enthusiastic surgery. But the point need not be laboured; every medical man or woman can fill in the details.

If we describe an evil we must look for the remedy. Unnecessary surgery is bad surgery and hasty surgery may easily be unnecessary. It is easy to say to a practitioner: "Thou shalt not operate in haste, but only after careful deliberation." There is no one to see that he carries out such an injunction; compliance must be left to his own conscience. There are regrettably those whose consciences appear to have atrophied from disuse because their owners either think more of operation fees than of anything else or have become so wedded to the scalpel (perhaps welded would be better) that they do not think they are treating a patient properly unless they are cutting something out of his body. Among the rest there are some who rush with flamboyant haste into unjustified operation, and of them it may be said either that they are thoughtless or that they are slaves to a bad habit. The question is after all largely a matter of common sense.

Again we refer to William Chisholm's address and his reference to a wise old doctor who said: "Science is a first-rate piece of furniture for a man's upper chamber if he has common sense on the ground floor. But if a man has not got plenty of good common sense, the more science he has, the worse for his patient." Whether a man devoid of common sense can acquire it is open to argument, but it is quite certain that habits of caution and deliberation can be cultivated so that they become ingrained qualities. When we were young we were told to "count ten" in certain circumstances before we spoke or acted. The practitioner can devise for himself some hurdle, comparable to counting ten in youth, that he will have to pass before he embarks on an operation which appears to him to be urgent. This is not such a puerile suggestion as it may sound; to the great majority of practitioners no such suggestion need be made, but the man of haste and hurry will do well to heed it. He can always, if he does no more, ask himself whether he has given enough thought to the patient's general make-up and temperament and whether the treatment he proposes to undertake will forestall or interfere with the healing power of Nature. Further, he will nearly always be able to obtain the help of another practitioner who possibly has more wisdom and riper experience than he. In conclusion it must be remembered that a man who undertakes surgical operation with undue haste may have base motives attributed to him. This discussion may thus be appropriately closed with the words of Charles Bell (quoted by William Chisholm):

The public who are ever so ready to determine on the merits of our profession, and even the patients who are to suffer are surprisingly ignorant both of the surgeon's motives for what he does and the propriety of the methods he puts in practice. He is continually operating in secret on a matter of necessity; the most sensible give the decision up to him; so that he is answerable to his own conscience and to that alone. Nor is the public aware of the temptations which men of our profession withstand. Credit for great abilities, gratitude for services performed and high emoluments are ready to be bestowed for a little deception and that obliquity of conduct which does not amount to actual crime. This is precisely the situation in which a man requires a thorough devotion to the principles of honour and right conduct to preserve him from the commission of error. These are the considerations which should make it the interest of society to hold the profession in respect and which make it the duty of every member of it to keep it pure.

Current Comment.

MESONEPHROMA OF THE OVARY.

A GREATER variety of tumours undoubtedly originates in the ovary than in any other organ of the human body. It is therefore perhaps not astonishing that confusion with regard to a proper classification of tumours has persisted longest in this particular field. It has been only in the last two decades that considerable progress in this direction has been made, but we are still far from common agreement about the best possible classification of ovarian tumours. One of the main reasons for the still prevailing uncertainty is that our conceptions of the normal embryology of the ovary and the derivation of its various structures are still under discussion. Nevertheless it has been possible to segregate out of a rather ill-defined mass of more or less malignant ovarian tumours four different entities which have received general recognition:

the granulosa-cell tumour, the arrhenoblastoma, the dysgerminoma and the Brenner tumour. In this way the number of cases which had previously been grouped under carcinoma or sarcoma has become very much smaller. Nevertheless this group seemed to be still rather large and too heterogeneous, and it has been suspected for a long while that it might be possible to separate further entities from this group.

A step in this direction was made by W. Schiller¹ in 1939. He reported on a series of ten cases which in his opinion comprised a new group. These tumours are semi-cystic or solid and have a tendency towards papillary growth, so that it is impossible to distinguish them macroscopically from papillary cystadenomata or carcinomata of the ovary. Histologically, however, they have a characteristic appearance. A typical area is composed of numerous small cystic spaces lined by a single layer of cells. These cells are usually flat, often broader than they are high, and have bulging nuclei and a very scanty protoplasm. In some areas the cells show greater proliferation. They may form some kind of papillary projections so that the cystic space may be almost filled. In areas with larger cysts and many papillary projections the general configuration may be similar to an ordinary papillary cystadenoma except for the characteristic cells exhibiting the typical projecting nuclei and the scanty protoplasm. The stroma of the tumours which sometimes is found to be infiltrated by tumour cells does not display any outstanding features. From the description of the characteristic cells it can be seen that they are much more related to endothelium than epithelium, especially that of the ordinary cystadenomata. In Schiller's opinion the cells resemble most closely the cells which line the glomerular tufts. Schiller has found in a number of tumours glomerular-like structures, and comparative studies of human embryos of various ages have convinced him that the structures of his tumours correspond with the early glomerular formations in the mesonephros. Further embryological studies have shown him that inclusion of mesonephric rests into the ovary or into other structures where such tumours occur is possible. For such reasons Schiller named this new group of tumours "mesonephroma".

Only a very small number of papers have since dealt with this subject. In 1940 H. W. Jones and G. E. Seegar² described six cases, temporarily adopting Schiller's views. Somewhat later, T. R. Kazancigil, W. Laqueur and P. Ladewig³ recorded three examples of malignant ovarian tumours presenting the same general picture as Schiller's mesonephroma of the ovary. Their study, however, failed to convince them of a derivation of these tumours from remnants of the primitive mesonephros. While a plastic reconstruction of one of Schiller's tumours gave additional evidence of their mesonephric origin, a similar reconstruction of a tumour of Kazancigil, Laqueur and Ladewig's series did not reveal such evidence. They take the view that the tumour cells are distinctly endotheliomatous in character and that many parts of the tumours can be interpreted as being of an angiomatic or angioendotheliomatous nature. While agreeing with Schiller on the presence of a new tumour group, they named the group, on account of their interpretation, "papillendothelioma ovarii".

In 1941 J. A. Tuta and J. E. Siebel⁴ reported an additional case. The tumour had occurred first in 1933 and had recurred in 1937. Both tumours were of typical appearance. In the recurrence glomerular-like structures were most marked. The authors adopted without much discussion Schiller's point of view. So did Rosenblatt and Grayzell⁵ when they reported on a further example of this group in 1942.

Recently H. W. Jones and G. E. Seegar⁶ have presented a paper on nine additional cases to the Section

¹ *The American Journal of Cancer*, January, 1939.

² *American Journal of Obstetrics and Gynecology*, February, 1940.

³ *The American Journal of Cancer*, October, 1940.

⁴ *Archives of Pathology*, March, 1941.

⁵ *American Journal of Obstetrics and Gynecology*, January, 1942.

⁶ *Archives of Pathology*, January, 1942.

on Pathology and Physiology at the ninety-second annual session of the American Medical Association. Apart from giving a description of their cases, they dealt mainly with two questions: First, is there a pathological entity such as that described by Schiller, and second, if so, what is the evidence for its histogenesis? The evidence at hand seems to justify the belief that this group of tumours has sufficient distinguishing pathological features to require separate classification. They point out that tumours of this group reach various degrees of differentiation. Kazancigil, Laqueur and Ladewig's tumours belong to the more immature forms, while Jones and Seegar Jones have included in their study only well-differentiated tumours and have excluded a number of borderline cases. In Schiller's series tumours in various stages of differentiation are described. With regard to the histogenesis, Jones and Seegar Jones are of the opinion that Schiller's suggestions are plausible, but that more evidence is needed before they can be finally accepted. If Kazancigil, Laqueur and Ladewig's interpretation of the tumours as being angiomatic in nature is correct, it has to be explained why similar tumours do not occur in other organs.

In the discussion following the presentation of Jones and Seegar Jones's paper, E. Novak also took the view that this group of tumours presented a definite entity, but he did not consider the evidence for their mesonephric origin as conclusive.

Reports on such tumours have not yet been forthcoming from this country. They cannot be extremely rare, as Jones and Seegar Jones have collected fifteen cases within a few years. A careful histological examination, especially of semi-cystic ovarian tumours, is likely to lead to the discovery of examples of tumours of this group, which seems now sufficiently well established, and may reveal further evidence towards their histogenesis.

HÄMOGLOBINOMETRY.

For colorimetric determinations to be carried out with reasonable chance of accuracy, and this applies particularly to estimations of haemoglobin, four essentials must be kept in view if the matching is to be made by the eye. It is assumed that the coloured media are physically and chemically stable. In the first place, each coloured field should be uniform. The use of cylindrical glass containers, as in the Haldane method, and all devices of travelling wedges are therefore faulty. Secondly, the two fields to be compared should be in optical contact. This has long been recognized as essential in polarimeters, colorimeters and spectrophotometers. Again, the Haldane technique breaks an important rule with the two tubes some distance apart. Thirdly, the two coloured media, the standard and the variable, should be chemically identical. Even if the eye is dispensed with and supplanted by the photo-electric cell this rule still holds. Haldane did good service by introducing actual blood as the standard. Fourthly, retinal fatigue should be avoided. Many physical instruments, such as photometers and colorimeters, suffer from the grave defect that what is physically fixed is assumed to be physiologically fixed. As a matter of fact the standard when viewed is shifting in value during the estimation. Haldane got over this source of error through the simple device of alternating the tubes by a half-circle rotation.

With the passing of coal gas as an illuminant the Haldane method of employing carboxyhaemoglobin has largely gone out of use and many substitutes have been suggested. Acid haematin has had a fair trial, but it is now generally recognized to give erratic results. The appeal to the eye has been displaced in a number of instruments by the photo-electric cell. Claude Rimington, in the *British Medical Journal* of February 7, 1942, gives a short criticism of the several methods used; he properly praises the spectrophotometer, but rules it out on account of the bulk and expense of the apparatus. His conclusions favour the use of pyridine-haemochromogen, which has a

bright pink tint and is relatively stable if reoxidation is guarded against. The light absorption is measured by a photo-electric cell. Pyridine-haemochromogen was first suggested by the South African Roets in 1940, who, we are reminded by Rimington, employed a less complicated technique, but sufficiently accurate for clinical work. At a meeting of the Biochemical Society on February 13 J. W. Clegg and E. J. King advocated alkali haematin, using as a standard pure haemin crystals dissolved in deci-normal soda solution. At a meeting of the Physiological Society on February 14 Claude Rimington, in collaboration with C. J. O. Morris, gave a demonstration of the pyridine-haemochromogen technique. The medical profession awaits a simple but reliable method as serviceable as was Haldane's and a little more accurate.

TRAUMATIC CEREBRO-SPINAL RHINORRHOEA.

AMONG the rarer sequelae of fracture of the skull is the condition, known as cerebro-spinal rhinorrhœa, which sometimes occurs when the fracture involves the paranasal sinuses. The condition is of importance because of its general surgical interest and because it may follow head injury due to gunshot wounds. W. E. Dandy, writing in Graham's "Surgical Diagnosis", discusses it as a symptom of pneumocephalus, a condition which may occur after a fracture of the base of the skull, when "air may be forced by swallowing, coughing or sneezing, through the paranasal or mastoid air cells into the cranial chamber". But cerebro-spinal rhinorrhœa is not always associated with a pneumocephalus or aerocele. The clinical importance of the rhinorrhœa arises from the fact that infection may enter along the path by which fluid escapes. One observer has gone so far as to assert that cerebro-spinal rhinorrhœa following trauma is invariably fatal unless the leakage is arrested either by spontaneous healing of the fracture or by surgical operation. Cairns is quoted in a recent article by Kenneth Eden¹ as having pointed out that in the acute stage of head injury complicated by rhinorrhœa surgical intervention is not essential to prevent intracranial infection and that many of the fistulae heal spontaneously. It is, Cairns holds, when rhinorrhœa is persistent or arises later that infection may spread from catarrhal conditions of the sinuses. Eden thinks that it should be possible nowadays, with careful selection of the route and the use of the sulphonamides, to reduce the mortality considerably below this level. For this reason it was decided at the outbreak of war at the E.M.S. Neurosurgical Unit, Haywards Heath, from which Eden writes, to attempt operative repair of all persistent cerebro-spinal nasal fistulae which were encountered. He gives details of the first results of this policy in two case reports. One case followed a bomb wound of the head and the other an ordinary civilian head injury. In the first case a bomb splinter had lodged at the back of the frontal sinus and a large intracranial aerocele was present. Symptoms began six weeks after the original injury. Operation was performed after prophylactic sulphonamide therapy and a hole into the frontal sinus on one side was blocked by a piece of *fascia lata* from the thigh. Recovery was uneventful. In the second case the patient suffered from a stellate fracture of the frontal bone extending into the frontal sinuses and up to the vault. The fracture was caused by a fall from a bicycle. A two-stage operation was performed and the ethmoid plates and back of the frontal sinuses were covered by a graft from the *fascia lata*. Recovery followed. There is only one aspect of this report which causes some surprise, and that is the reported withholding of sulphonamides from the second patient, "in order to test the risk of infection in this type of operation". Surprise is the greater because of Eden's remarks about selection of operative route and the use of sulphonamides already quoted. In any case, no idea of "the risk of infection" could be obtained from one example. Apart from this point Eden's article is well worth careful study.

¹ *The British Journal of Surgery*, January, 1942.

Abstracts from Medical Literature.

PATHOLOGY.

Three Cases of Meningioma.

D. H. ACHOLA (*Archives of Neurology and Psychiatry*, September, 1941) has removed ten intracranial meningiomas from a patient, fifty-seven years of age, who made a good post-operative recovery. Multiple meningiomas not associated with von Recklinghausen's disease are apparently very rare, only three such cases having been observed amongst 295 cases of intracranial meningeal growths in Cushing's series.

H. N. GUANOW (*Archives of Pathology*, August, 1941) describes the case of a meningioma in a woman, seven-two years of age, which although being of a mature, well-differentiated benign type, had invaded the brain and led to multiple metastases in the lungs. Only three such cases have been previously described in the literature, but all these growths were not as clearly differentiated or as mature histologically as that in the case presented.

M. HUNTER BROWN AND J. W. KERNIGHAN (*Archives of Pathology*, October, 1941) report a third case. In a man twenty-three years of age the spinal cord was found entirely surrounded by a haemorrhagic tumour from the level of the first thoracic vertebra to the *conus medullaris*. Histologically the tumour proved to be a fairly immature meningioma and the authors conclude that the condition should be considered as a neoplastic transformation of multicentric origin in an incompletely differentiated arachnoid membrane.

Incidence and Localization of Coronary Artery Occlusions.

RECENT publications have emphasized a long-standing doubt of the closeness of the correlation between the usual clinical evidence for "coronary occlusion" and the post-mortem demonstration of such a lesion. The accuracy of this correlation, however, has been so frequently assumed that it colours the whole concept of coronary artery disease. The sources of this error arise first, according to M. J. Schlesinger and P. M. Zoll (*Archives of Pathology*, August, 1941) in the misinterpretation of clinical data in terms of pathological phenomena when pathological examination has not been made, and second, in the use of inadequate methods of post-mortem examination of the coronary arteries. They have investigated this subject again, using an improved technique for studying the pathological alterations in the coronary artery system. Briefly, this method consists of (a) injecting radio-opaque lead-agar masses of different colours into the coronary arteries, (b) unrolling the heart so that the entire coronary artery tree lies in one plane, (c) taking a skiagram of the unrolled heart, and (d) carefully dissecting the coronary arteries, using the film as a guide. This technique discloses all narrowings, occlusions and anastomoses of the coronary arteries in every heart examined. Using this technique, the authors arrived at the following conclusions. More than one-half of the points of occlusion in the coronary arteries are overlooked by ordinary dissections. Most zones of occlusion of

the coronary arteries are less than five millimetres in length and are therefore easily overlooked. Occlusions are as numerous in the right coronary artery as in the left descending coronary artery. There is no relation between the manner of branching of the coronary arteries and the localization of occlusions therein. The majority of coronary artery occlusions are found within three centimetres of the mouths of these vessels.

Vascular Tumours of Bone.

A REVIEW of current opinions on the pathology of vascular tumours indicates, according to Atha Thomas (*Surgery, Gynecology and Obstetrics*, April, 1942) that they are mesenchymal tumours arising from congenital rests by a process of endothelial proliferation and differentiation into new blood vessels. They occur in both benign and malignant forms. They are true endothelioma. The typical benign angioma is a highly differentiated structure, composed of fully developed blood vessels, which grows slowly and with little evidence of cellular activity. Malignant angioma, on the other hand, are characterized by rapid growth, invasion of surrounding tissue and sometimes metastasis. They consist of very cellular angioblastic tissue which in its histogenesis tends to revert to the original primitive mesenchymal structure, producing a varied histological picture differing greatly from the well-differentiated benign forms. Often in these malignant forms the primitive mesenchyme will assume morphological characteristics resembling either connective tissue (sarcoma) or epithelial tissue (carcinoma), rendering their histological diagnosis extremely difficult. They all, however, possess one feature in common, essential for diagnosis. There is always present an angioblastic tendency, evidenced by endothelial proliferation and the formation of new blood vessels. Tumours arising from blood vessels in bone are rare. The benign forms possess certain radiological and pathological features which are practically diagnostic. These features are described in considerable detail. The malignant forms, on the other hand, are most varied in their structure and growth and offer more difficult problems in diagnosis. It is suggested that on the basis of histogenesis the malignant angioma of bone can be divided into two subdivisions, the angioendothelioma and the angiosarcoma. Angioendothelioma is an angioblastic tumour, but with an epithelial-like structure, difficult to distinguish from metastatic carcinoma. In angiosarcoma the vasiformative tendency is a more predominant feature, the new blood vessel being the unit of the tumour rather than the proliferating endothelial cell. Examples of both of these types of malignant angioma are included in the series. These two groups vary greatly in their growth and malignant tendencies, and they possess few characteristic radiological or clinical features distinguishing them from other malignant tumours of bone. Diagnosis is based largely on their histological appearance. They are only moderately radio-sensitive.

Changes in Osseous Tissues of Young Dogs after Prolonged Administration of Oestradiol Benzoate.

It has been demonstrated that when young mice of certain strains receive repeated injections of oestrogenic substances they develop osteosclerosis. Little is known, however, of the

changes occurring in the osseous tissues of young dogs after prolonged administration of such oestrogens. Charles J. Sutro and Leo Pomerantz (*Archives of Pathology*, March, 1942) therefore report a study of this question. They found that the prolonged administration of oestradiol benzoate to young mongrel dogs did not cause osteosclerosis. Inhibition of the growth of the skeleton and disturbance of the development of bone in the penis, however, did occur. No changes were evident in the pubic symphysis or in the sacro-iliac joints. These findings contrast in part with those noted as occurring in certain strains of young mice, in which not only inhibition of skeletal growth, but also osteosclerosis resulted from treatment with oestrogens. The absence of osteosclerosis in the dogs suggests that other factors besides the inhibition of growth may be responsible for the excess of production of bone in certain animals after the administration of oestrogen.

Pathogenesis of Gastro-Duodenal Ulcer.

ACCORDING to Lester R. Dragstedt (*Archives of Surgery*, March, 1942), during the past twenty years a great many significant experiments have been performed and observations made that have helped to bring into view certain conditions under which chronic progressive ulcer in the stomach and intestines may be expected. As a direct result of planned experimental procedures the disease has been caused to develop in dogs, cats and rats, and to duplicate in almost every particular that encountered in man. The gross and histological appearances of the experimental ulcer exactly resemble those of the clinical lesion, and it has been observed to perforate, to cause profuse and fatal hemorrhage and to heal under a type of medical management which resembles that found effective in man. By application of the results obtained in laboratory animals to the condition in man the author arrives at the following conclusions. The chemical and mechanical traumas produced by the normal gastric content are not sufficient in themselves to cause ulcers in the normal gastric and duodenal mucosa and to prevent them from healing or to delay materially the healing of extensive lesions artificially produced. This resistance to the digestive action of the normal gastric content is, moreover, not limited to the gastric and the duodenal mucosa, but is displayed to a considerable extent also by such organs as the spleen, the kidney and the pancreas. Pure gastric juice, on the other hand, can destroy and digest all living tissues, including the wall of the stomach itself. In this effect the gross and the histological appearance of the typical progressive ulcer and the associated gastritis in man are exactly reproduced in the laboratory animal. Under normal conditions the gastric wall is not digested away because it is not exposed to pure gastric juice. Food, which in the normal person is the stimulus for the formation of gastric juice, is also the chief factor which protects the tissues against its corrosive activity. Pancreatic juice, gastric and intestinal mucus, duodenal juice and bile (probably in the order named) constitute an additional mechanism which protects the duodenal and, to a certain extent, also the gastric and the jejunal mucosa. When excessive volumes of normal gastric juice are continuously secreted in laboratory

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animals, this defensive neutralizing mechanism is overcome and ulcer is produced. It is probable that in man a similar excessive secretion of gastric juice often occurs and ulcer results. It seems likely that in most cases this hypersecretion is neurogenic and is abnormal in the sense that it operates when the stomach is empty and in the absence of the usual stimuli for gastric secretion.

MORPHOLOGY.

Giant (Betz) Cells of the Motor Area.

A. M. LASSEK (*Archives of Neurology and Psychiatry*, June, 1941) finds that there is a great variability in the size of the large motor (Betz) cells in the motor area of man. The average size of the cells measured in the upper third is 1,978 square microns, in the middle third 1,702 square microns, and in the lower third 1,592 square microns. The term Betz or giant cell is non-specific. Therefore, it cannot be said with assurance that these cells give sole origin to the pyramidal tract fibres. The author believes that the Betz cells may be concerned with the conveying of speedy impulses to the lower motor neurones.

Effect of Crossing Nerves to Antagonistic Muscles.

R. W. SPERRY (*Journal of Comparative Neurology*, August, 1941) describes a series of nerve-crossing experiments on the rat. He found that in ten rats, of ages ranging from 40 to 250 days, the exchange of the nerve connexion of flexor and extensor muscles in the shank produced a reversal of foot movement. In all ten cases the foot movement remained fixedly reversed to the end of the experiment with no corrective modification whatever. Seven rats were kept longer than fifteen months after the operation. Immobilization of the contralateral hind foot, training the rats to rise upright on their hind legs for food, and amputation of both front legs at the shoulder all failed to induce reeducation. Post-mortem examination and physiological tests showed that nerve regeneration had been as intended, that sensitivity of the shank and foot had not been impaired by the operation, and that sensory as well as motor fibres had reinnervated the muscles. Severance of the crossed nerves abolished the reversed movement. Control animals, similarly treated, except that the nerves were reconnected to the original muscles, showed foot movement in normal phase in all activity. In two additional rats unilateral transposition of both flexor and extensor muscles after the nerves to these muscles had previously been crossed resulted in foot movement in normal phase. No change toward reversal occurred after fifteen months. In twenty rats, ranging in age from fifteen to eighty days, the peroneal and tibial nerves were crossed instead of the single nerve branches to individual muscles. This operation produced an abnormal limb coordination characterized by indiscriminate contraction of the shank muscles and a predominance of plantar flexion of the foot. This abnormal coordination persisted for eighteen months without any sign of a central nervous adjustment. The results furnish new evidence of the rigid organization in the rat of the basic motor patterns for hind limb coordination. They also show that,

in a mammal, motor nerve cells in post-embryonic condition do not have the capacity to undergo muscle-specific modulation after regeneration into foreign muscles. These results are at variance with the predominant opinion in neurosurgery, which seems to be that, although the crossing of limb nerves in human patients results at first in a corresponding distortion of sensation or response, this can be corrected in time by reeducation, provided there are not bifurcations to non-synaptic muscles or to receptors of different modality.

Spinal Autonomic Outflows.

D. SHEEHAN (*Journal of Comparative Neurology*, October, 1941) has made an estimate of the preganglionic fibres of the thoraco-lumbar and sacral autonomic outflows in man and monkey. In man the thoraco-lumbar outflow is fairly constant from T1 to L2 inclusive; the lower boundary may occasionally be at L1 or L3. That C8 may occasionally contribute remains a possibility, though if such an arrangement occurs it must be exceedingly rare. The sacral outflow is usually confined to S3 and S4, with an occasional small contribution from S2 or S5. In the monkey the thoraco-lumbar outflow is more variable than in man. The usual outflow extends from T1 or T2 (more often the latter) to L3 or L4 (in almost equal proportion) below. There is an occasional downward extension to L5. The sacral outflow in the monkey is chiefly from S1 and S2, with one, two or all three sacral nerves participating with considerable variation. In the monkey there is a tendency for the lower boundary of the thoraco-lumbar outflow to extend lower with a posterior type of lumbo-sacral plexus, but no such relationship has been observed between the upper boundary and the fixation of the brachial plexus. There is a tendency for S1 to participate in the sacral outflow when the lumbo-sacral plexus is prefixed, and for S3 to participate when the plexus is post-fixed. The presence of a few small medullated fibres in other ventral roots, in the cervical and lower lumbar regions, is confirmed in man and monkey, but their number is rarely more than 100 in each root. Their significance is not clear.

Adrenal Innervation.

W. E. MACFARLAND AND H. A. DAVENPORT (*Journal of Comparative Neurology*, October, 1941) give an account of a comparative study of the innervation of the adrenal. The adrenal innervation showed a similar pattern throughout the series. The left adrenal gland of the albino rat was studied in detail, with normal innervation and after splanchnic section. Section of the greater splanchnic nerve at the diaphragm on either right or left side caused degeneration within five days of from 75% to 90% of all fibres in the gland. In a few instances all nerves degenerated. Sympathetic ganglia were not found in the rat adrenal, but some were found outside the gland in the meshes of the nerve supply. Other mammals had capsular ganglia and a few sympathetic cells in the medulla. There was no evidence of cortical innervation. Medullary innervation consisted of terminal arborization about individual chromaffin cells. Bulbous endings in the medulla were rare and, in general, the smallest visible fibrils appeared as smooth filaments, about 200 millimicrons in diameter, which ramified on

the surfaces of chromaffin cells. Interstitial cells of Cajal, a sympathetic ground plexus as interpreted by Boeke, or any type of syncytial terminal network was not present. Intracellular nerve endings were not seen.

The Ductus Arteriosus in the Human Fetus and Newborn Infant.

G. J. NOBACK AND I. REHMAN (*The Anatomical Record*, December, 1941) present a description, with numerous figures, of the topographical relations, size, shape and course of the *ductus arteriosus* in the human fetus and newborn infant, which is different from that presented up to date in the literature. The size of the ductus is much larger than is generally assumed, being equal to or greater than the aortic arch, the pulmonary artery or the descending aorta. The course of the ductus is more directly antero-posterior, highly arched, and parallels that of the aorta. It bulges markedly to the left and extends further in an inferior direction than is usually stated. The *ductus arteriosus* enters the descending aorta on its antero-lateral aspect and does not pass into the medial surface of the arch of the aorta, as recorded in the literature.

Absence of the Posterior Arch of the Atlas.

C. E. BROWN (*The Anatomical Record*, December, 1941) reports an atlas which completely lacked the posterior arch. It occurred in a male, aged seventy-four years, and was discovered in the dissecting room. The anomalous atlas was associated with synostosis of the second, third and fourth cervical vertebrae, forming a single piece not fused with the atlas. The axis presented a median prominence on the posterior arch superiorly, to which the *rectus capitis minor* muscles were attached in the absence of the posterior tubercle of the atlas. There were no signs during life referable to the anomalous vertebrae and no symptoms traceable thereto, and at dissection there was no evidence of disease.

Ratio of Preganglionic to Post-ganglionic Neurones in the Autonomic Nervous System.

G. A. WOLF (*Journal of Comparative Neurology*, October, 1941) determined in cats the ratio of preganglionic to post-ganglionic neurones. The ratio of preganglionic fibres in the cervical sympathetic trunk to cells in the superior cervical ganglion was found to be 1 to 11 and 1 to 17 respectively in two animals. In the ciliary ganglion the ratio was found to be 1 to 2.

Section of the Spino-Thalamic Tract at the Inferior Olive.

H. G. SCHWARTZ AND J. L. O'LEARY (*Archives of Neurology and Psychiatry*, February, 1942) present evidence indicating the efficiency of section of the spino-thalamic tract in the medulla for relief of high intractable pain. The results of the operation in the case of carcinoma of the breast with metastases are given. By means of the Marchi technique the courses of the spino-thalamic, spino-tectal and ventral spino-cerebellar tracts have been followed through the brain stem. The position of the spino-thalamic tract in relation to the inferior olive has been ascertained, and a topical arrangement of fibres within the tract is described. Fibres from the lower dermatomes occupy a lateral position, while fibres from the upper dermatomes lie medially.

Medical Practice.

GENERAL ANÆSTHESIA AND DENTAL EXTRactions.

THE Council of the Victorian Branch of the British Medical Association has received from the Victorian Branch of the Australian Dental Association the following letter on the subject of general anaesthesia and dental extractions. The subject is of such importance that the letter is published hereunder for the attention of readers.

Australian Dental Association,
193, Spring Street, Melbourne, C.I.
15th May, 1942.

The Secretary,
British Medical Association,
Albert Street,
East Melbourne, C.W.

Dear Sir,

The Council of the Australian Dental Association (Victorian Branch) is concerned over the increasing frequency of lung abscess following dental extractions under open ether anaesthesia given in the supine position.

While recognising to the full the responsibility of the dental surgeon in such accidents as aspiration of teeth and foreign material, this Council is of the opinion that an improvement in the type of anaesthesia given by the medical practitioner would lessen the risk of such happenings.

In the past the medical profession has recommended endotracheal anaesthesia as the solution of this problem. Unfortunately the general medical practitioner as a rule cannot give this type of anaesthetic—nor is the patient prepared to pay for specialists and hospitalisation.

As a practical alternative to this "Counsel of Perfection", this Council feels that the adoption of the following points would materially improve the conditions under which the dental surgeon operates, and thus reduce the incidence of lung abscess.

1. The use of a semi-supine or modified Fowler's position—with the head and shoulders propped up, enabling the dental surgeon to extract teeth in the position to which he is accustomed—providing better access and less risk of foreign material falling back into the pharynx.

2. The use of a continuous anaesthesia, provided by such a method as the *Intra-nasal Endopharyngeal method*, using a hand blower and nasal catheter.

The technique is simple—induction in the usual way, then insertion of a nasal catheter into the pharynx—the apparatus required is inexpensive and portable. Such an anaesthetic could readily be given by a general practitioner even in a patient's home, without much extra cost to the patient, and permits an adequate packing of the pharynx and reasonable operating conditions for the dental surgeon.

The Council of the Victorian Branch of the Australian Dental Association is anxious to fully co-operate with the British Medical Association in bringing about the adoption of these suggestions by the general practitioners in both medicine and dentistry, and asks for support and action by your Council.

Yours faithfully,
(Sgd.) GEORGE FINLAY,
Honorary Secretary.

Naval, Military and Air Force.

APPOINTMENTS.

THE undermentioned appointments, changes et cetera have been promulgated in the *Commonwealth of Australia Gazette*, Number 152, of May 28, 1942.

CITIZEN NAVAL FORCES OF THE COMMONWEALTH.

Royal Australian Naval Volunteer Reserve.

Appointment.—Alan Francis Oxenham is appointed Surgeon Lieutenant (on probation), dated 2nd April, 1942.

AUSTRALIAN IMPERIAL FORCE. Australian Army Medical Corps.

Captain VX64372 A. J. Barnett is transferred from Reinforcements with regimental seniority in accordance with his Army seniority, 28th January, 1942.

AUSTRALIAN MILITARY FORCES. Australian Army Medical Corps.

The provisional appointments of Captain (Temporary Major) N273359 J. R. Black and Captains N270694 H. G. Cummine, N278571 E. P. Connolly, N90613 J. H. Wilson, N90615 F. N. Lynch, N90617 H. J. Solomon, N90618 R. C. Scoble are confirmed.

Captains (provisionally) G. J. Byrne and Q48385 H. W. Noble are brought on the authorized establishment, 21st September, 1939, and 16th August, 1940, respectively.

The notification respecting the appointment of Captain (provisionally) D. A. Kidd, which appeared in Executive Minute No. 44/1942, promulgated in *Commonwealth Gazette* No. 70 of 1942, is withdrawn.

The following officers are transferred to the Reserve of Officers with the Honorary Rank of Lieutenant-Colonel: Lieutenant-Colonel Sir H. B. Devine and Captain (Temporary Lieutenant-Colonel) Q123067 V. McDowall, 13th April, 1942, and 16th April, 1942, respectively.

Major C. C. McKellar and Captain C. M. Greer are transferred to the Reserve of Officers, 13th April, 1942, and 1st April, 1942, respectively.

The following officers are appointed from the Reserve of Officers: Majors H. Flecker and J. A. Smeale, 24th January, 1942; and R. F. Craig, D.S.O., 2nd February, 1942; and Captains S. St. J. Grace, 28th February, 1942; N278584 S. A. Horsman, 30th March, 1942; and N393027 D. S. Atkins, 1st April, 1942; and Honorary Majors V10753 D. D. Browne and to be Major (provisionally), 1st February, 1941; and B. B. Blomfield and to be Major (provisionally) supernumerary to the establishment of Majors with pay and allowances of Captain, 13th April, 1942.

The following officers are appointed from the Reserve of Officers and to be Captains (provisionally): Honorary Captains V6925 A. A. Ferris, 22nd October, 1940; V19482 F. Catarinich, 7th November, 1941; R. H. Black, 8th November, 1941; D. R. Wallman and J. D. Fotheringham, 15th December, 1941; C. T. Petheridge, 17th December, 1941; F. A. Dibden, J. Fairley, R. E. B. Jones, F. J. Laycock and R. V. Southcott, 2nd January, 1942; V144664 E. J. L. Claridge, 5th January, 1942; V10676 A. Richardson, 13th January, 1941; V145633 W. R. Angus, 21st January, 1942; W. J. Chapman, D. A. A. Davis and A. E. Lee, 24th January, 1942; G. Middleton, 1st February, 1942; P438 G. H. McQueen and P440 A. G. Schroeder, 14th February, 1942; V146330 D. C. Lear, 16th February, 1942; V147259 G. E. Foreman, 12th March, 1942; C. J. Constable, 25th March, 1942; T. G. Hewitt, 1st April, 1942; B. Hooper, 6th April, 1942; J. B. D. Smith, 7th April, 1942; C. B. R. Mann, 8th April, 1942; R. A. McCullagh, 9th April, 1942; M. Allen, 10th April, 1942; and W. S. McGrath, 15th April, 1942.

To be Majors (temporarily).—Captain W16550 W. Cawley, 20th April, 1942; and Captain (provisionally) J. F. Funder, 22nd April, 1942.

To be Captains (provisionally).—Alfred Adolph Esser, Thomas Gilmour Bowen Allen, Charles Walker, John Campbell Pickering and Alexander Tremaine Park, 30th April, 1942; Arnold William Dean, 1st May, 1942; Philip William Atkins and Geoffrey Alleyne Cook, 2nd May, 1942.

The resignation of Honorary Captain R. H. Oxby-Donald of his commission is accepted, 14th April, 1942.

Honorary Captain S38773 H. E. Fellow is retired, 6th April, 1942.

To be Honorary Major.—Victor Richard Ratten, C.B.E., 21st April, 1942.

To be Honorary Captains.—Thomas Victor Walpole, Stephen Empson Williams, Daniel Ross Arnott McOmish, Hedley James Parker McMeekin, Christian Alan Kuhlmann, Arthur Basil Corkill, James Clough, George Herbert Cashmore, Richard Howard Cowling, Leslie Charles George Colville, Patrick John Robinson, Everton Rowe Trethewie, William Mitchell Box and Clive Varney Childs, 22nd April, 1942; Roy Graff, 23rd April, 1942; Peter Willis Verco, Allan Gordon Rowe, Kenneth Ernest Ratten, Robert John De Neufville Souter, Trevor Alfred Ridley Dinning and Colin Marshall Gurner, 27th April, 1942.

CASUALTIES.

ACCORDING to the casualty list received on June 8, 1942, Captain W. Aitken, A.A.M.C., Coburg, Victoria, is reported to be a prisoner of war.

Correspondence.

MEASUREMENT OF DRYING CAPACITY OF WIND.

SIR: The article by Dr. C. E. Corlette on the measurement of the drying capacity of wind in your issue of May 23 interested me very much because this problem occupied my thoughts and led to considerable experimentation over a number of years. Dr. Corlette has put the physical analysis clearly and concisely, but I would venture on one criticism. I early discovered that no method of measuring wind velocity then devised gave data which could be accepted as satisfactory for the simple reason that all anemometers gave the horizontal resultant only. Before the invention of the aeroplane men thought two-dimensionally of travel and of air movement, and so winds were described as coming from some point of the compass. But the aeroplane and glider have taught us that air can fountain upwards or cataract downwards, and then there are small vortices which can be effective in drying but are left unrecorded by anemometers. The hot-wire method gives a much more useful reading, though not readily translatable into a definite velocity. The tank of water used by meteorologists, with its evaporating surface horizontal, is but little responsive to air currents other than the horizontal resultant and can therefore give faulty information about the drying capacity of the air as it affects the human body. These considerations led me to devise a spherical evaporimeter elevated above the ground. If anyone doubts the importance of air currents other than the horizontal, let him take a reading with such an evaporimeter and then place a sheet of canvas, such as a tent fly or even a bed sheet, a few feet above it. The anemometer reading remains unaltered, but the evaporation drops. Dr. Corlette may not agree with my conclusions, but I place more reliance on the amount of actual evaporation than on calculation. I have often thought of improving my evaporimeter by making it thermostatic at a temperature of about 30° C.

Yours, etc.,

W. A. OSBORNE.

The Hall,
Kangaroo Ground,
Victoria.
May 25, 1942.

ESSENTIAL HYPERTENSION.

SIR: A letter appearing in your issue of May 2, written by Dr. Sydney Pern, refers to a paper recently read by me on the subject of essential hypertension. Dr. Pern disagrees with me that the cause of this condition remains obscure and that our treatment, at best, is directed towards the symptoms or the effects of it rather than towards the cause. He believes that tissue deterioration, brought about by "virulent organisms and their deadly toxins", is responsible for many cases of hypertension. He goes on to mention a pyorrhetic young woman whose systolic blood pressure fell from 220 millimetres to 160 millimetres as a result of teeth extractions.

In reply to this contention I wish to point out that hypertension arising from "any demonstrable cause" cannot, at present, be classified as essential and therefore is beyond the scope of my discussion.

The above paper did not deal with the question of etiology, but mention of that aspect here may not be irrelevant.

As a result of recent research there has been a swing back towards the theory of the renal origin of essential hypertension. Numerous partially successful attempts had been made to produce hypertension in experimental animals, but in 1934 Dr. Harry Goldblatt, of Cleveland, succeeded in producing long-sustained hypertension in dogs by means of incompletely occluding the renal arteries with silver clamps. The duration of the rise in pressure was limited only by the length of the experiment. Irvine Page, of Indianapolis, later produced similar results by enveloping the kidneys in "Cellophane". The essential factor in these experiments was reduction of renal pulse pressure. That the hypertensive change was brought about by a humoral pressor substance elaborated in the ischemic kidneys was demonstrated when experimental results were found to be the same after the kidneys had been denervated. This pressor substance is known as renin. Purified renin itself has no vasoconstrictor properties when perfused, but, when a fraction of pseudoglobulin of the blood (renin activator) is added, a vasoconstrictor substance, termed angiotonin, is produced. This has been isolated as a crystalline thermostable substance.

In perfusion experiments angiotonin too requires an activator. This is indicated by the fact that tachyphylaxis develops after a second or third injection in the course of the experiment and that after a rest period of thirty to forty-five minutes angiotonin becomes active again. This suggests that angiotonin-activator, or its precursor, must be incorporated into the cellular protoplasm of the vessel walls and not in the blood which is present throughout. Page has found that an angiotonin-like substance is much increased in the peripheral blood in animals with experimental hypertension, in patients with essential and nephritic hypertension, and in normal dogs and rabbits after the injection of renin.

The interpretation of these results bearing on the nature of pressor substances and their biological significance in disease is difficult. The most acceptable conception of the cause of essential hypertension, however, is that renal arteriolar changes bring about lowered renal pulse pressure with the ensuing effects as outlined above.

It may be contended that "focal sepsis" is responsible for the initial renal vascular changes found in hypertension, but this is mere conjecture. It has been aptly said that "focal sepsis" has never been conclusively shown to produce anything but focal sepsis.

Yours, etc.,

BRUCE T. SHALLARD.

141, Macquarie Street,
Sydney,
May 2, 1942.

Obituary.

JAMES HUGO GRAY.

We are indebted to Professor J. Burton Cleland for the following appreciation of the late Professor James Hugo Gray.

James Hugo Gray, whose death on December 20, 1941, at the early age of thirty-two, occurred at Epsom in Surrey, from a newgrowth in the lung, was an already distinguished young South Australian who had quite recently been appointed professor of anatomy at Saint Mary's Hospital Medical School, London. Hugo Gray was born in Adelaide on March 14, 1909, the eldest son of James T. Gray, now of Orrroroo in South Australia. He came of a family who acted on the principle that the pursuit of knowledge was of all things to be sought and affluence or even financial comfort of secondary importance. After doing remarkably well as a schoolboy at Saint Peter's College, Adelaide, and in his matriculating examinations (six subjects with four credits in the Leaving Examination, 1925, and four subjects and two credits in the Leaving Honours in 1926), Hugo started on the medical course in 1927, passing every examination with credit and winning the Dr. Davies Thomas Prize in 1929 and the Everard Scholarship in 1932. He graduated M.B., B.S. at Adelaide in December, 1932, when he was awarded a David Murray Scholarship to enable him to carry out at the South Australian Museum during the long vacation work on the osteology and other aspects of the physical anthropology of the Australian aboriginal. On the quality of his published papers he was granted the degree of M.D. of the University of Adelaide in 1939.

He was a resident medical officer at the Adelaide Hospital in 1933, and in 1934 demonstrator of anatomy under Professor Wilkinson. During his student's course his inclinations were directed towards anthropology through the influence of Dr. T. D. Campbell and of Professors H. H. Woollard and H. J. Wilkinson, and he began with the study of Australian aboriginal skulls. He was a member of the Adelaide University Central Australian Anthropological Expeditions of 1930 to MacDonnell Downs, 1931 to Cockatoo Creek, 1932 to Mount Liebig, and 1933 to the Musgrave Ranges. During these expeditions, working with Dr. Campbell and Professor Wilkinson, he devoted every possible moment from daylight till late at night in helping to collect a mass of metrical measurements and other anatomical and dental data on the natives under observation such as had not hitherto been attempted in Australia. His assiduity was remarkable. From this material he, with his colleagues, prepared and published the following papers: "The Physical Anthropology of the Aborigines of Central Australia; Part I, Anthropometry, and Part II, Non-Metrical Characters of Surface Anatomy", with T. D. Campbell and C. J. Hackett, *Oceania*, Volume VII, Number 1, September, 1936, pages 106-139, and Number 2, December, 1936, pages 246-261 respectively; "Some Pathological Lesions Seen in Central Australian Aborigines", "Pathological Lesions in the Natives of Central Australia",

and "Pathological Lesions met with amongst the Aborigines in the Musgrave Ranges, South Australia", with J. B. Cleland, *Journal of Tropical Medicine and Hygiene*, Volume XXXVI, Number 9, May, 1933, pages 125-128; Volume XXXVII, Number 1, January 1, 1934, pages 1-9, and Number 20, October 15, 1934, pages 305-311 respectively; "The Hair Tracts of the Australian Aboriginal", *Journal of Anatomy*, Volume LXIX, Part II, January, 1935, pages 206-225; "Observations on the Teeth of Australian Aborigines", with T. D. Campbell, *Australian Journal of Dentistry*, Volume XI, August 1, 1936, pages 290-296; and "Amongst the Aborigines", *Adelaide University Magazine*, Volume VI, Number 27, December 9, 1931, pages 8-9.

Hugo Gray's early associations determined him to make anatomy his life's work. He wrote to Professor Woollard, who promised to help him if he came to England. He left Adelaide without having a definite appointment in view and expected he would have to earn his living at first as a *locum tenens*. However, he was given a research scholarship under the British Empire Cancer Campaign to work at Saint Bartholomew's, where he was also appointed an honorary demonstrator in anatomy in 1935-1936. Following Professor Woollard's translation, he next became a full-time demonstrator in anatomy at University College, London, in 1936-1937 and senior demonstrator in 1937.

When Professor Woollard died in January, 1939, Gray took full charge of the primary fellowship class in anatomy and he was acting head of the Cardiff division of the department of anatomy during the session 1939-1940. His last teaching work was done at Leatherhead. He was appointed to the chair at Saint Mary's in April, 1941.

In addition to the anthropological papers already mentioned, Gray published the following:

"Preliminary Note on the Mast Cells of the Human Pituitary and of the Mammalian Pituitary in General", *Journal of Anatomy*, Volume LXIX, Part II, January, 1938.

"The Relation of Lymphatic Vessels to the Spread of Cancer", *The British Journal of Surgery*, Volume XXVI, 1939, pages 462-495.

"The Lymphatics of the Stomach", *Journal of Anatomy*, Volume LXXI, 1936, page 492.

"Studies of the Regeneration of Lymphatic Vessels", *Journal of Anatomy*, Volume LXXIV, 1939, page 309.

He read the following papers at meetings of the Anatomical Society of Great Britain and Ireland: "Observations on Lymphatics, with Remarks on Technique" (with H. H. Woollard), Volume LXX, June, 1935; "The Lymphatics of the Stomach", Volume LXXII, February, 1937; "Regeneration of Lymphatics in Human Tissues", Volume LXXII, May, 1937; "Experiments on Lymphatic Regeneration", Volume LXXII, June, 1938; "Experiments on Growth and Regenerative Capacity of Lymphatic Trunks", Volume LXXIII, May, 1939.

He married Miss L. E. Wiebusch, daughter of the late Reverend C. A. and Mrs. Wiebusch, of Gawler, and left three daughters. E. W. Gray, a younger brother, was the South Australian Rhodes Scholar for 1932.

Hugo Gray was a very thorough and, moreover, brilliant investigator, as his published papers reveal. We mourn with his other British colleagues and all who hold true knowledge in esteem, the loss of one, born amongst us, whose promised career of still greater endeavour has been untimely cut off.

Dominations and Elections.

THE undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Sara, Charles Ashur, M.B., B.S., 1940 (Univ. Sydney), 87, Fletcher Street, Bondi.
Barr, Kenneth Archibald, M.B., B.S., 1941 (Univ. Sydney), NX77251, Captain K. A. Barr, 2/12 Field Ambulance, A.I.F., Australia.

Australian Medical Board Proceedings.

QUEENSLAND.

THE undermentioned has been registered, pursuant to the provisions of *The Medical Acts*, 1939 to 1940, of Queensland, as a duly qualified medical practitioner:

Khan, Edward Joseph, M.B., 1941 (Univ. Sydney), Section 19 (1) (a), c.o. District Hospital, Mount Isa.

Books Received.

"Handbook of Hygiene for Students and Practitioners of Medicine", by Joseph W. Bigger, M.D., Sc.D., F.R.C.P.L., M.R.C.P. (London), D.P.H., M.R.I.A.; Second Edition; 1941. London: Baillière, Tindall and Cox. Large crown 8vo, pp. 426, with 18 illustrations, including 1 plate. Price: 12s. 6d. net.

Diary for the Month.

JUNE 16.—New South Wales Branch, B.M.A.: Ethics Committee.

JUNE 17.—Western Australian Branch, B.M.A.: Branch.

JUNE 18.—New South Wales Branch, B.M.A.: Clinical Meeting.

JUNE 23.—New South Wales Branch, B.M.A.: Medical Politics Committee.

JUNE 25.—New South Wales Branch, B.M.A.: Branch.

JUNE 25.—South Australian Branch, B.M.A.: Branch.

JUNE 26.—Queensland Branch, B.M.A.: Council.

JUNE 26.—Tasmanian Branch, B.M.A.: Council.

JULY 1.—Western Australian Branch, B.M.A.: Council.

JULY 2.—South Australian Branch, B.M.A.: Council.

JULY 3.—Queensland Branch, B.M.A.: Branch.

JULY 7.—New South Wales Branch, B.M.A.: Council Quarterly.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmain United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phoenix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205, Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

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Members and subscribers are requested to notify the Manager, THE MEDICAL JOURNAL OF AUSTRALIA, Seamer Street, Glebe, New South Wales, without delay, of any irregularity in the delivery of this journal. The management cannot accept any responsibility unless such a notification is received within one month.

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